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Bell Telephone MAGAZINE

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C. Earl Schooley

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American Telephone & Telegraph Company · New York

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A Medium of Suggestion & A Record of Progress

JUDSON S. BRADLEY, *Editor.* *Published four times a year for the supervisory forces of the Bell System by the Public Relations Department of the* AMERICAN TELEPHONE AND TELEGRAPH CO., *195 Broadway, New York 7, N. Y.*
CLEO F. CRAIG, *President;* S. WHITNEY LANDON, *Sec.;* ALEXANDER L. STOTT, *Treas.*

Who's Who & What's What

in This Issue

C. EARL SCHOOLEY's first telephone job was with the Bolivar (Mo.) Telephone Company, where he was a combination of night operator, lineman, installer, and troubleshooter. In 1927 he joined the Long Lines Department in St. Louis as a student, and two years later became a technical employee in the division office there. A transfer to Kansas City and a return to St. Louis preceded his assignment to the Engineering Department in New York. Here he worked on carrier systems, and in 1944 was appointed coaxial cable carrier engineer and in 1946 was appointed carrier and electrical coördination engineer. He went to Washington, D. C., in 1948, as division plant engineer, and returned to New York after a year and a half as facilities engineer. He became engineer of transmission in February 1950, and at the end of that year was transferred to the Commercial Department of Long Lines to assume the new post of commercial development engineer. His next move was to the Engineering Division of A. T. & T. Company's Department of Operation and Engineering, as toll line dialing engineer, in April 1951. He became plant extension engineer in August of that year, and since early 1952 he has been System planning engineer. It is in this capacity that he serves as Chairman of the Headquarters Long Range Planning Committee. With Richard D. Campbell, he contributed "Spanning the Continent by Radio Relay" to this MAGAZINE for Winter 1950–51.

SINCE LAST SEPTEMBER, RUSSEL T. KING has been Right-of-Way sales engineer, in charge of the group concerned in these activities in the Commercial Division of the O. & E. Department of the A. T. & T. Co. Mr. King started his telephone career in the commercial department of the Western Area of Bell of Pennsylvania in 1929. After holding positions in the sales organization, he was appointed assistant sales manager—directory in 1940. Mr. King came to A. T. & T. in 1943 in O. & E.

C. Earl Schooley

Russel T. King

Donald A. Dobbie

Walter H. Flinn

Elizabeth Wrenshall

Commercial as a member of the trade mark service group. He has held assignments in the new and special services, radio sales, and Right-of-Way groups.

MORE THAN two years of Naval service in World War II interrupted a career in Accounting and Treasury work which began for DONALD A. DOBBIE in 1927 with the New York Telephone Company. Soon after returning to that Company's General Accounting staff in 1946, he transferred to the Methods Division of the A. T. & T. Company's Comptroller's Department. Four years later he moved to the Earnings Division of the Treasury Department, and the following year he moved back to the Comptroller's Department. Here, in the tax section, he is in charge of the group responsible for tax research and analysis.

WHEN WALTER H. FLINN wrote the article on Plant training schools which he contributes to this issue, he held the position of plant organization and training engineer in the Plant Division of A. T. & T.'s O. & E. Department. But since last March 1, he has been employee information manager in the Public Relations Department of the Illinois Bell Telephone Company in Chicago. This is a return to familiar territory, for Mr. Flinn's telephone career began with that Company in 1928 as a central office dial switchman. Promotions in the Plant Department brought him through district plant superintendent and division plant supervisor to division plant superintendent by 1950 —with a year as general personnel supervisor. It was the first of last year that he came east to the A. T. & T. post which he has now relinquished.

MUCH OF THE information received from foreign telephone administrations in connection with the A. T. & T. bulletin "Telephone Statistics of the World" is written in languages other than English, and ELIZABETH WRENSHALL finds her facility with foreign languages useful in gathering and compiling the data which she uses in her daily work in the Chief Statistician's Division of the Comptroller's Department. After making translations for the censorship authorities during World War II, Miss Wrenshall joined the A. T. & T. Company in 1945. This is her fourth contribution to this MAGAZINE, her most recent previous one being "How the Telephones of the World Are Distributed," in the issue for Spring 1952.

(*Continued on page 67*)

A Modern Telephone Structure

Efficient location, size, type, and provision for enlargement were among the important long-range considerations involved in the erection of this headquarters building of the New England Telephone and Telegraph Company in Boston. *See the article beginning on the opposite page*

A Broad Objective of the Bell System Is to Enable Any Customer to Dial Calls across the Continent as Easily As He now Dials a Neighbor across the Street

Long-Range Planning: The Present's Guiding Star

C. Earl Schooley

In 1910, when there were only 376,000 telephones in New York City, the late John J. Carty, then Chief Engineer of the A. T. & T. Company, predicted that twenty years later there would be over two million. When the year 1930 rolled around, the actual number of telephones turned out to be 1,761,000—short of the forecast made twenty years before by about 18 per cent but, nevertheless, a remarkably close estimate for a period so far ahead and in a relatively new business!

What useful purpose did such a prediction have? What good does it do to forecast for such a long period ahead? Perhaps some things Mr. Carty said at the time he made this prediction will give answers to these questions.

He pointed out that in order to care properly for the communications services the public needed and would want, fundamental long-range plans by the telephone companies were a necessity. The long-range plans would be based upon all the factors that it would be possible to obtain, and the final result would be something in which each telephone company could express its confidence by using it as a guide or goal in the necessary construction each year.

Mr. Carty said the plans would represent the best judgment of qualified telephone people of what would be required ahead during a period of perhaps twenty years. He was careful to point out that no one can forecast with precision the requirements for so long a period ahead. But the telephone companies by 1910 had been working many years with fundamental long-range plans, and they knew the plans formed a trustworthy guide—provided they were kept broad. The plans would be continuously under review and modified from time to time as new develop-

When this picture of lower Broadway, New York, was taken, in the '80s, no one could then foresee the advances and revolutionary changes in communications which would occur. Nor can any one now predict what the future will bring. But flexible, intelligently coördinated long-range plans will take change into consideration in looking forward to the provision of efficient and economical nation-wide communication service

ments or changed conditions were introduced.

These thoughts of Chief Engineer J. J. Carty have been expressed in many different ways by many telephone people since the telephone was invented. In January 1953, the Directors of the A. T. & T. Company sent a message to the share owners of the company which contained this paragraph:

"Finally, it seems to us that it is always our duty to act for the long run. Sound financing, good earnings, reasonable and regular dividends—these are all long-term projects. So is our continual research to find better means for giving better service. So is the building of the human organization and character on which good service depends. So is the training of leaders. In all our undertakings, the long view is essential."

Can there be any doubt that long-range planning is a prime requirement of the successful operation of a long-range business?

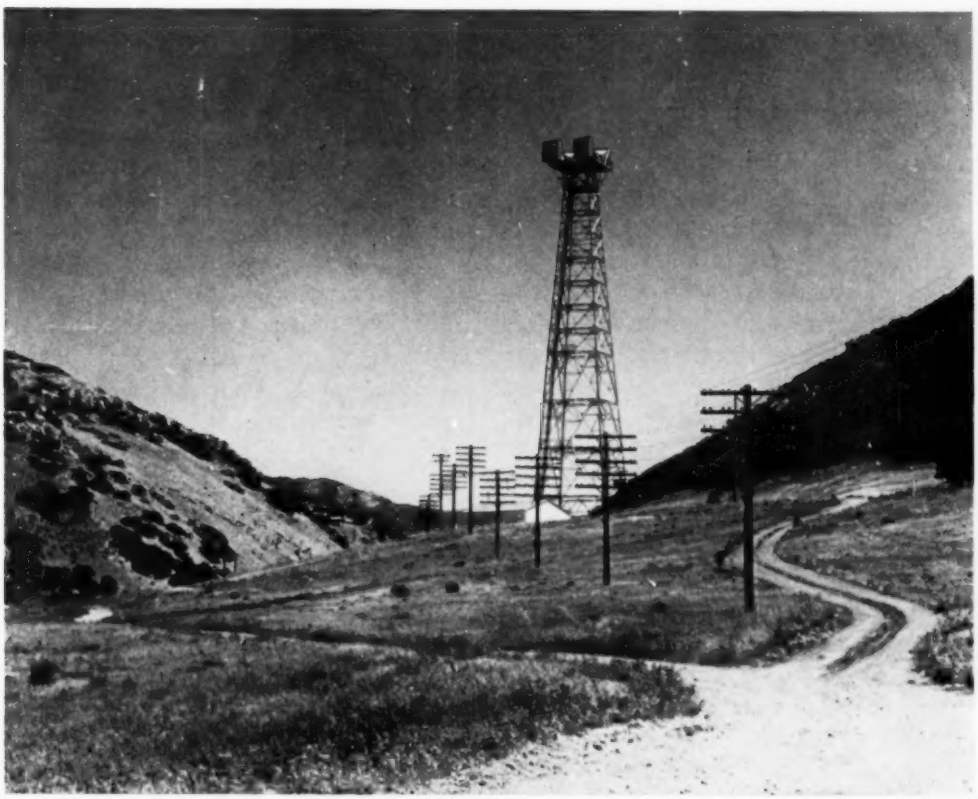
Present Importance of Long-Range Planning

THERE probably was never a time in the history of the telephone industry when long-range planning was so important or so generally needed as today.* This is true because of the large growth being experienced in both exchange and toll service and the many changes taking place in the art of communication. The increasing complexity of the communications system will in time make it difficult to maintain satisfactory service if today's methods of establishing connections between telephone customers continue to be used.

* See "The Telephone Looks to the Future," by George L. Best, MAGAZINE, Spring 1952; and "Communication Sets Its Sights Ahead," by Harold S. Osborne, MAGAZINE, Summer 1952.

With the recent remarkable developments in electronics, opportunities to improve telephone service are perhaps greater now than they have ever been. Each new development in the technical field makes it possible to make telephone service still more valuable. When nation-wide or continent-wide dialing (since Canada is included in the plan) becomes effective, service should be faster and mechanization should permit making more efficient use of intercity circuits. If *the objective of one integrated traffic system* is to be realized, it is evident that a considerable amount of thinking and planning must be done to establish the future goals as clearly as possible.

Many business organizations have found out the value and necessity of planning for the future. Certainly every organization that has stayed in business over the years can say—and rightly—that it has planned for the future. In many cases, planning ahead has meant planning only for the next few years. For the telephone companies, planning for the next few years is just a matter of using the best tools available to get a job done. For the longer range,



New and old: a tower of the Bell System's transcontinental radio relay route dwarfs poles of an open-wire toll line. These and other means of transmission all have their places in the System's grand design of enabling people to talk with one another—no matter where

A broad objective of the Bell System is to move steadily toward an ultimate goal which will enable any customer to dial his calls across the continent as easily as he now dials his neighbor across the street. Today, 80 percent of the local service in the Bell System is on a dial basis, and it is anticipated that within ten years the remainder of this job will be virtually completed. Meanwhile, enough long distance circuits have become dial-operated to permit operators to complete more than 40 percent of the calls by dialing directly to the called telephones in distant cities. Some day the local and long distance systems will become one integrated system.

plans will determine the job there is to do and give an indication of new tools that must be developed and made available to do it. Long-range plans are subject to continuous change as new forecasts of the conditions of the future reveal the need.

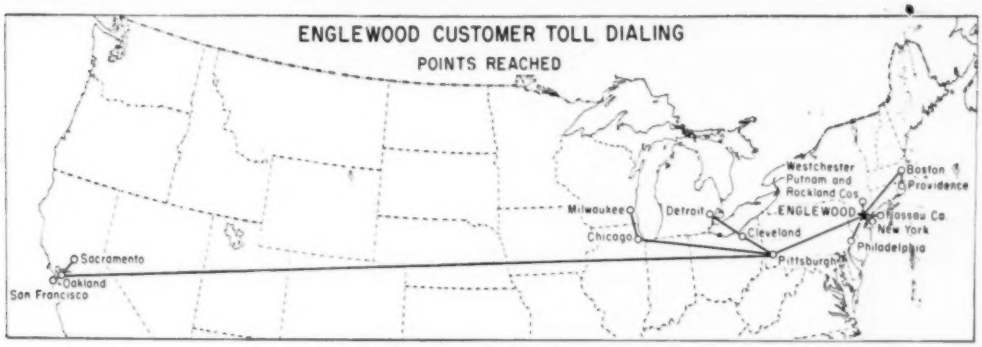
The telephone companies have for many years periodically reviewed their accomplishments and forecast what the period ahead may bring. All planning is based on forecasts, and forecasts may be likened to highway signs that tell industry where it is going and about how far. The future cannot be predicted with accuracy; but telephone people with a sound telephone background and experience can make estimates that are, within broad limits, sufficiently accurate for planning purposes. In long-range planning, a forecast of the exact date when a situation will be reached may not be too important; for, once a situation has been foreseen, it can be met when it does occur.

Naturally, as predictions of the future are extended beyond one or two years, the plans based on these speculations become somewhat tentative. Forecasts of trends in general business conditions, decentralization of industry, movement from cities to rural areas, population growth, the number of telephones in service, and the number of long distance calls to be made are in the realm of crystal-ball-gazing when directed fifteen or twenty years ahead.

Long-range plans are based on predictions of the future, and are therefore too broad in scope and look too far ahead to be supported by a detailed program of construction. There is no sharp dividing line between current plans and long-range plans; but long-range plans do establish a goal and serve as a guide for the current projects. Unless unusual and unexpected conditions intervene, plans can be set well in advance to reach the desired goals. Planning enables current construction programs to be formulated to turn forecasts into accomplishments. Planners help decide what is to be done, when, how, and by whom.

Post-War Advances

ANTICIPATING the goal set for the future, a trial of nation-wide customer dialing was started at Englewood, New Jersey, late in 1951. Newly developed central office switching and accounting apparatus made it possible for the telephone subscribers in Englewood to dial directly to about 11,000,000 telephones in thirteen metropolitan areas. Calls to Boston,



Customers in Englewood, N. J., are able to dial directly to the cities and entire metropolitan areas shown above

Pittsburgh, San Francisco, Milwaukee and other cities are now being dialed by Englewood customers on a regular day-to-day basis.

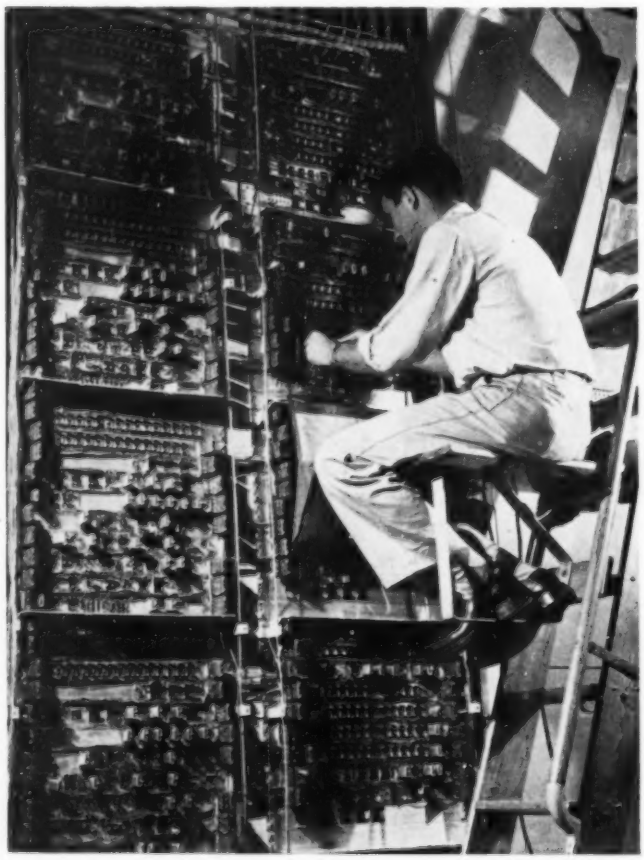
The results of this trial have been very encouraging, and the services are being continued permanently. Englewood customers have no difficulty in dialing the proper codes to reach the distant points. Nearly all the calls which can be dialed are being dialed. While it may be some years before this service is made generally available, there will be other Englewoods as conditions permit. The Englewood test has pointed the way for expanding this service. Setting up and carrying out this trial shows that extensive coördination is required to carry out the long-range plans. The far-flung aspects of the Bell System make it essential that methods of handling the calls be standard and that anything planned for one city be known and reflected in dialing plans in all other cities. Promised developments of the Bell Laboratories, not yet complete, are now being incorporated into the long-range plans of the telephone companies to permit other customers to dial their own calls.

Another step toward the goal of nation-wide dialing established as a result of long-range plans is now getting under way in Washington, D.C., where the first system of centralized automatic message accounting is being

A simple assumption used as a basis for long-range forecasts is that the country will continue to grow and that improvements in ways of living and methods of conducting business will be made. The telephone business in the United States can be expected to grow with the country and expand in scope. The telephone industry should not lack potential customers. Every day there are new needs for telephone communication. With a longer life span for humans and an expanding population, more homes will be kept intact—and more homes have always meant more telephones. More industries, more businesses to serve this ever expanding population, will meet the wants rising from a higher standard of living and bring forth new and complex requirements for every-day communications.

installed for service in the Fall of 1953. Washington customers, for the most part, and those in suburban Virginia and Maryland will then be able to dial each other directly and also make their own calls to Baltimore. Eventually, of course, they will be able to dial their own calls throughout the nation.

At present, all calls of this type, of which there are thousands daily, are handled on an individual basis from many different switchboards in the Washington area. It has become increasingly difficult to maintain service economically over this large area by handling the calls on the present basis. When the centralized automatic accounting equipment is available, next fall, customers will dial the calls they want and accounting data for each call will flow automatically into the new equipment while the dialed call speeds on directly to the called telephone. Pending the development of automatic means for identifying each calling telephone, an operator will have to obtain that information from the customer and route it into the centralized equipment—a matter of only a few seconds. The equipment to do this Washington job is the result of a great deal of planning ahead about this type of problem.



Customer dialing of long distance calls requires complex equipment. The long-range objective is to enable any telephone user in this country and Canada to reach any other simply by dialing the call

These are just two of the steps being taken toward the broad objective. Others are being suggested for inclusion in current construction programs by long-range planning committees in action in the telephone companies. These committees serve to coördinate the work necessary to forecast and plan for the future. Traffic, plant, commercial, engineering, and accounting representatives usually make up the committee membership. In the Headquarters organization these departments are represented and, in

AN EXAMPLE of the fundamental importance of long-range planning is found in the design and construction of buildings to house the component parts of the country's vast telephone system. The usual economical initial building period of four to six years is an important factor in keeping down capital requirements; yet even more important is the provision, in original design, of flexibility to permit continuing expansion for many years ahead. It is essential to give weight to many factors in selecting the site for a telephone building, be it a little community dial office or an isolated repeater station or a multi-story metropolitan structure; but probably the most vital consideration of all are the long-range plans for future development. Size of lot to permit lateral expansion, or provision of foundations capable of bearing added stories—or both if indicated—are standard procedure. This long-range flexibility is important particularly when unknown factors may affect the accuracy of commercial predictions made for periods 20 years ahead. Growth estimates, with consequent additions and rearrangements of equipment, are made every few years, and buildings must be adaptable, with a minimum of disturbance and inconvenience, to changing requirements.

addition, Bell Laboratories and Public Relations share in the committee work. It is the duty of the Headquarters long-range planning committee to keep the company committees abreast of new developments which may affect the telephone industry in its future operations.

Other Communications

WHAT ABOUT other communication needs? What is happening to television, radio, telegraph—and the customers who need special types of communication service?

While the broad objective of nation-wide dialing has been proposed, other kinds of communication are not being forgotten. These needs are included in the work of long-range planning.

Television networks have grown from two circuits between New York and Philadelphia at the end of the War to over 30,000 miles of circuits connecting 83 cities and 128 stations. More is yet to come. No long-range plans are complete unless television is included. This means local television distribution, theater television, private closed-circuit television, and color television—as well as expansion and growth as new stations go on the air and require network connections.

Improvements in the speed of transportation have introduced problems that require more, faster, complex communication networks. The nation's commercial air lines are today using more than 300,000 miles of communication circuits to assure that reservations are properly made, that baggage and freight are properly accounted for, and that planes fly safely and on time. Every mile of these circuits, although provided by the telephone industry, is for the exclusive use of the air lines. The needs are increasing and the mileage is growing daily.

Besides these special communications requirements, communication networks are operated by the Civil Aeronautics Administration to develop and distribute, among other

things, accurate weather information for commercial and private flying. There are more than 270,000 miles of circuits dedicated to providing this type of intelligence. Altogether, 570,000 miles of communications circuits are provided by the telephone industry and make up the heart and nerves of air transportation in the United States.

Most of this has taken place within the last ten years. Commercial air lines are generally less than 25 years old. Who can tell what new type of communication need will arise in the next 25 years? Planners need not know exactly what these needs will be, but the plans for them can be based on the technical facilities now available and those expected to be available in the few years ahead. By keeping the plans flexible and fluid, changes can be made as quickly as the future communication needs seem to form a definite image.

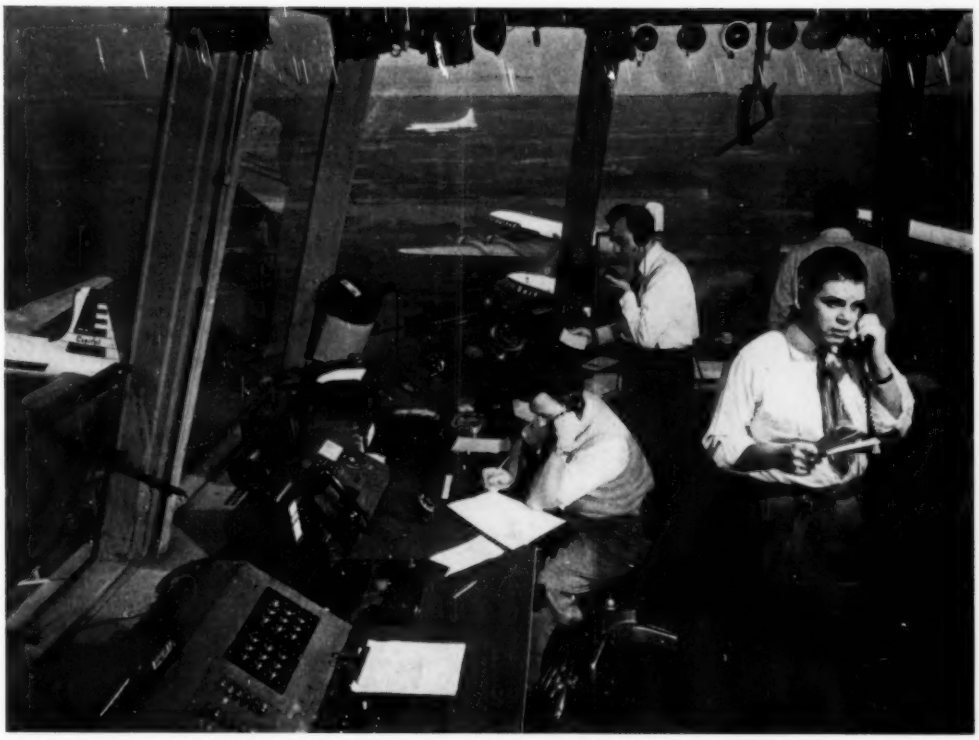
What are some of the questions about the future that the telephone planners will try to answer?

Here are a few.

When the 'teen-agers of today become heads of their own households, how many calls will they make and how long will they talk?

When telephone customers of the

Customer dialing of long distance calls requires automatic equipment to time each call, compute the charge, and record other details necessary for billing. The details of many calls are first recorded electrically on a single tape, which is then unscrambled by this computer, transcribing the data in proper sequence on other tapes



This scene in the control tower at New York's LaGuardia Field illustrates one phase of the complex communication facilities needed for the operation of the nation's airways

future can reach any telephone in the United States and Canada by dialing, how many more calls will they make than they do now?

How many telephones will families want in their homes?

What special communication needs will individuals, business, and industry have? What new technical developments will be needed?

How big should telephone manufacturing facilities be, and how much of what kind of raw materials are going to be needed?

New developments in the communication field which affect long range plans are constantly being made available by the Bell Laboratories. The Laboratories work deals, in essence, with the technical future. Research is the birthplace of new discoveries. As new developments become a practical reality, there is an obligation to use them in the telephone business if they will further the service policy. These developments are made available to others outside the telephone business, so that all can benefit, through a liberal practice of non-exclusive patent licenses.

The transistor is a development of the Bell Laboratories which is being introduced into the telephone business and may eventually change the character of a good part of the telephone plant. It was invented at the Bell Laboratories in 1947. The transistor is essentially an amplifying unit which

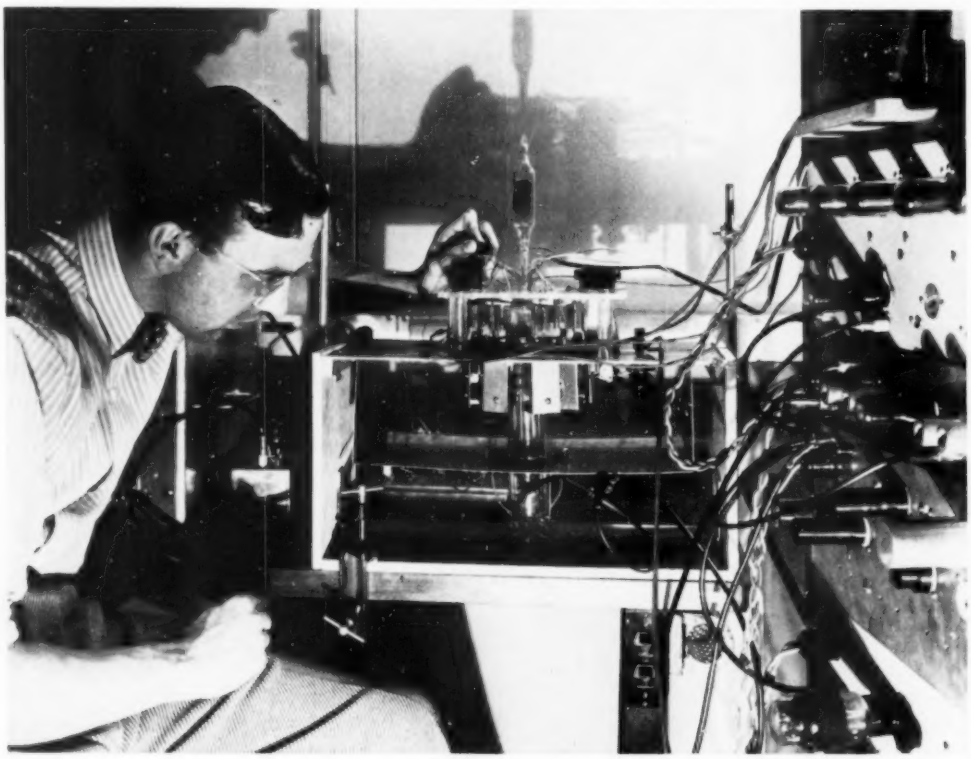
does the same work as some types of vacuum tubes. It is extremely small and requires relatively small amounts of power to operate.

Other developments of the Bell Laboratories, while not as spectacular as the transistor, are surely destined to have marked effects on the future telephone plant. Smaller, more efficient, more compact electrical and mechanical parts for telephone equipment will permit crowding more circuits into the same space, usually at less expense and with easier maintenance. Each new development seems to permit the accomplishment of more and more complex jobs.

Unexplored Opportunities

LOOKING INTO the future is one of the most fascinating jobs in any business—and particularly in the telephone business, where new and unexplored opportunities for service are continually being uncovered. Many prophecies have been made about the telephone business, yet hardly anyone today is amazed at the possibilities the future may bring, since so many past prophecies have come true.

It may be many years before the ultimate service objective will be reached. By that time, if history repeats itself, the telephone companies



New instrumentalities and techniques are constantly being developed and perfected at the Bell Telephone Laboratories to improve existing services and to provide for new services as needs arise. Shown here is an engineer at the Laboratories making adjustments on an experimental electronic "memory" tube

Close coördination and coöperative effort among the various departments, and among the telephone companies themselves, are essential to make long-range planning effective

will have newer and better objectives which will result in giving the customer more and better service. Meanwhile, since it is continent-wide in scope, all of the Bell System companies and all of the Independent telephone companies in the United States and Canada will ultimately be involved in some way. In making long-range plans, every part of the telephone business—engineering, traffic, commercial, plant, Western Electric Company and Independent manufacturers, Bell Laboratories, accounting, legal, public relations—will contribute towards setting the goal.

Long-range plans would point out the need for developing and introducing new instrumentalities. They would indicate the quantities of equipment, the types of equipment, the outside plant, the transmission systems, and the number, size, and location of buildings needed over the years to realize the goal.

But long-range planning is not all machines, electronics, and complex technical equipment. Well-trained people to carry out sound policies are essential to long-range plans and a requisite to the rendering of the best service possible. And plans must be considered to keep alive and strengthen the personal relationship between those who use the service and those who furnish it—a relationship on which so much of public understanding rests.

Once the plans are formulated, the number of people needed to operate and maintain the communication network and handle the accounting and commercial work is indicated. Out of the plans should come information which would help to determine the amount of money needed to keep the

business growing as the customers' needs grow. The plans are also important to the establishment of rate structures which will guarantee that the business will continue to be an attractive place for investors.

The Needs of the Customers Will Determine

IN THE FINAL ANALYSIS, everything the Bell System does must be weighed for the effect in the long run. Continued improvements in service, from the standpoint of both dependability and speed, good earnings, and fair treatment of employees are all long-range projects. Better means for giving better service, the building of a human organization, and the training of leaders are essential elements in plans for the years ahead.

As the telephone companies study and foresee the future wants and needs of their customers, the ability to fulfill those requirements with new technical developments not now available will determine the design of the telephone plant and operations for the years to come.

Planning for a Coronation

From the British *Post Office Magazine*

The Post Office is proud of the part it will play in the historic events of the month of June, when all its resources will be drawn upon in connexion with the Coronation celebrations, for in recent reigns the association of the Sovereign with the Post Office has been a particularly happy one.

The work of the telephone engineers has already begun. Special facilities have been provided for the Earl Marshal's Office and the engineers are now to plan a central switchboard around which the whole organization of the procession and ceremony will revolve. For the Coronation of King George VI a hypothetical "Coronation Telephone Exchange" was created. No doubt our experts have something similar in mind now. Not the least of their tasks will be to provide facilities for crowd control and the circuits from microphones to control points, from control points to Broadcasting House, from Broadcasting House to transmitters, so that commentaries on the procession and the ceremony may be broadcast. This time too, there will be television, with again more work for the Post Office.

Pipe-Line Networks, Electric Power Grids, and Railroad Systems Are Turning Increasingly to Facilities Provided By Bell System Companies

Communications for Right-of-Way Companies

Russel T. King

WITHIN THE MEMORY of many, mother can still be seen trimming the wicks and filling the "coal oil" lamps of yesterday, while father and the boys curried and tended the horses and filled the wood box near the stove. Yet in less than one life span, the oil lamp has become a curiosity, the horse as a work animal has been largely replaced, and father probably flips a thermostat instead of the wood-box lid. All this has happened through new and improved methods of transporting oil and gas, electric power, and other raw materials for better living.

And behind this change is the story of more and better communications.

Natural gas, today, goes to market through a vast network of steel arteries—pipes—fanning out from the Gulf Coast of Louisiana and Texas to the Pacific on the West, the head waters of the Mississippi and the Great Lakes on the North, and eastward to the Atlantic and New England. Crude oil, too, moves on schedule from well head to consumer through underground highways. Electric power for home and factory travels at nearly the speed of light from generator to user over sprawling webs of overhead wires and subsurface cables. With equal precision, the nation's railroads move people from point to point and the products of industry and the soil to their places of ultimate usefulness.

These miracles of transportation have one requirement in common: fast, dependable, 24-hour-a-day communications, not only between people but also between sensitive electronic devices. And as the utility highroads to market grow more complex, communications become increasingly important.

Utility company communications are generally of two kinds. One involves ordinary day-to-day business

transactions between the public and the utility company and within the utility organization, over facilities similar to those everybody uses. The other concerns highly specialized requirements relating to the utility's internal operations. In both cases these needs can be and are being met completely by the telephone companies.

Pipe-Line Information

PICTURE a public service business operating through isolated countryside on a narrow strip of land stretching from the Rio Grande to New England. Such is one of the world's longest natural-gas pipe lines. To insure efficiency of operations along this pipe line, all activities must be carefully coordinated from a central dispatching point in Texas through a fast, dependable communications system. This system ties together some 180 gathering points at the beginning of the line, about 20 compressor ("booster") stations along the way, and nearly 100 sales stations in the northeast.

Communications play a vital part in the efficiency, safety, and scope of these vast operations. They help to keep the flow constant, clean, and adequate to meet the growing requirements of customers. Every hour on the hour, 365 days a year, the dispatchers gather numerous statistics from the field—such as suction and discharge pressures, temperature of the gas as it enters and leaves each station, atmospheric temperature, number of engines in service—which are recorded on a dispatching report. It is this dispatching report that the superintendent of gas control uses to regulate the flow of gas, balancing the "through-put" to correspond with customer demands or operational needs as they arise.

There was little need for communications in operating the nation's early pipe lines. Probably the first commercial line was laid down in 1863. It was a jointed two-inch iron pipe, two and a half miles long, that carried crude oil between the Tarr farm and the Humbolt refinery in northwestern Pennsylvania. It had a short life, for local teamsters, who were getting $3 to $5 a barrel for transporting oil in those days, violently resisted all attempts to construct pipe lines.

Finally, a Martin Van Sickle built in the same general locality a six-mile line of 2-inch cast-iron pipe, with three steam-driven pumps spaced at intervals along the line. Apparently half his crew laid pipe while the other half fought off teamsters. Van Sickle put 80 barrels a day through the 6-mile line at $1 a barrel—less than half the rate then prevailing by team. Today petroleum products travel as much as 1,400 miles through pipe lines at 45 cents a barrel.

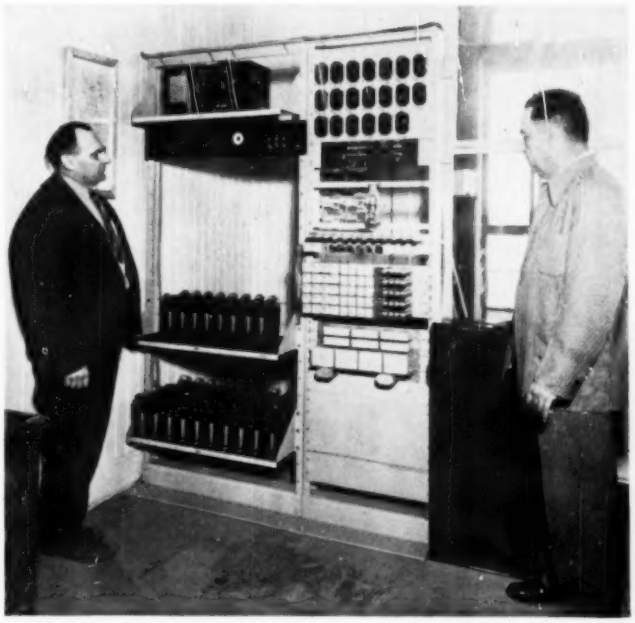
Modern Communication Methods

THE EARLY attempts to transport oil and gas to market by pipe line cast a long shadow before them. As demand for oil and gas products pyramided in succeeding years, the underground transportation system kept pace. Today the network of pipe lines which carries gas, crude oil, and refinery products to homes and factories in America exceeds 533,000 miles in length, and is growing at the rate of about 15,000 miles a year.

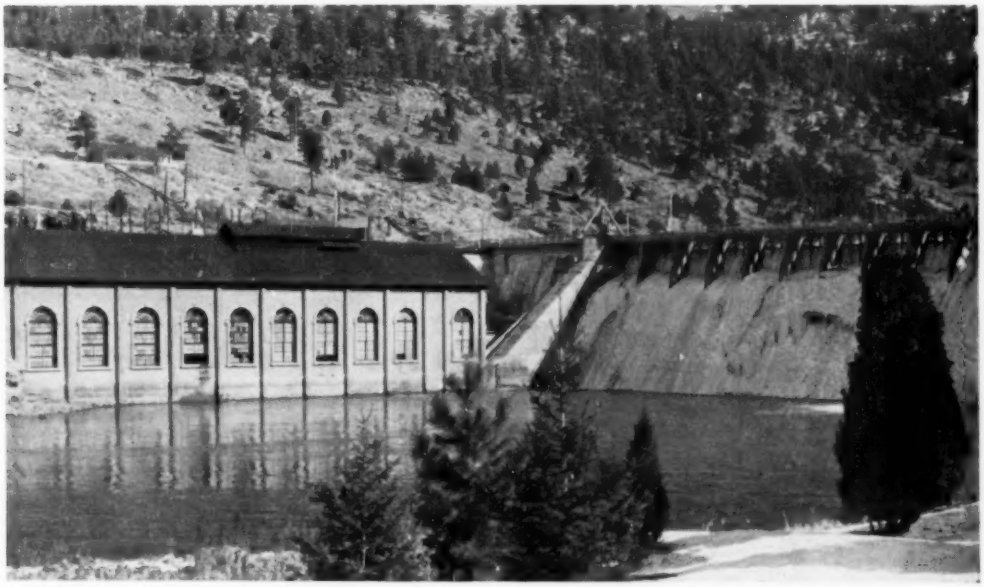
These underground lines employ enough pipe to circle the globe over twenty times, yet the chances are that even in localities where pump or com-

pressor stations are situated, the average citizen is only vaguely aware of their significance. Yet these stations house machinery that never stops running — machinery which controls the flow and the quality of natural gas and petroleum products.

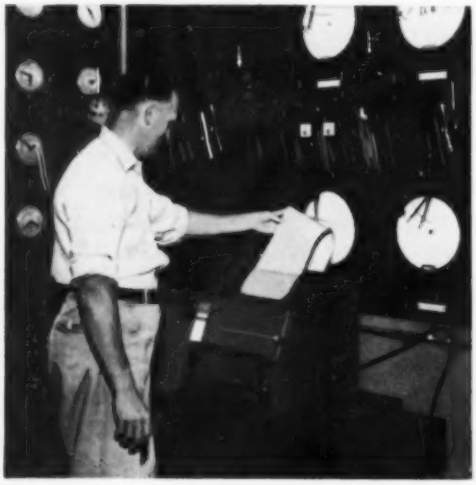
Initially, the pipe-line companies often provided their own communications system, located along their rights of way. Today, as these systems need additions and replacements, more of the pipe-line companies are turning to the commercial telephone companies for communications facilities.



Station operators at the dam below read signals showing the position, at three unattended automatic substations, of main transmission line switches, feeder oil circuit breakers, changes in oil temperatures, operating air pressures, control voltages, and similar operating data



Special indicating equipment provided by the telephone company bring reports to the operators here



The station engineer of a pipe line receives word from the chief dispatcher to expect the flow of gasoline at a given time

He proceeds outside and makes the necessary adjustment to the valve

He reports back: "All open and ready to receive," and soon gasoline is pouring into the storage tank at the terminal

Recently, for instance, the Tide-Water Pipe Line Company, Ltd., considered the oldest long distance pipeline company in existence, had Bell System private line teletypewriter service installed for operational and administrative purposes. The new communications system replaced its privately-owned Morse telegraph system. During 1952 many pipe lines accepted recommendations from Bell System Companies for internal communication networks either in whole or in part.

Power Company Needs for Communications

THE IMPORTANCE of communications in power company operations for dispatching and control purposes is apparent when one considers that a power system must generate at each moment the exact amount of power required by the customers. Storage of electricity on a large commercial scale is impossible.

Generating plants are not generally located at the load centers. Thus power has to be distributed from various plants to where the load is. Communications are essential in coordinating this distribution. Each power company has a dispatch center, which is the nerve center of its operations. The load dispatcher forecasts load requirements of the system, arranges for power generation to meet these requirements, and insures delivery of energy to areas where it is needed. He is responsible for the maintenance of the system frequency and the over-all operation of the power system. He orders the prompt isolation of sections affected when trouble hits, and calls for the system rearrangements necessary to maintain continuity of service.

In order to discharge his responsibilities, the dispatcher must have communication facilities over which he obtains the information he needs to run his job. He must have means of communicating with his headquarters administrative office, with other load dispatchers in his own area and in interconnected power companies, and with his main generating plants and substations. He must have various control and metering circuits.

The generation of electric power and its use in the United States dates back to the late 1870s. Initially, generation was limited in scope by the low voltages of the d-c distribution systems. The use of electric power was confined principally to cities where one power station could serve a number of customers. The first alternating current system in America using transformers was put in service at Great Barrington, Massachusetts, in 1886, to serve about twenty customers—including the local telephone office.

SINCE early operations were limited, communications facilities were provided by wires added to the power companies' pole lines along their rights of way. As the power companies expanded, and improved techniques made the transmission of electric energy over longer distances practicable, there was an increasing need for additional communications facilities. In the 1920s, carrier communications systems were developed which made it possible to transmit communications over the same wires used to carry power. This new medium helped to meet expanding communica-

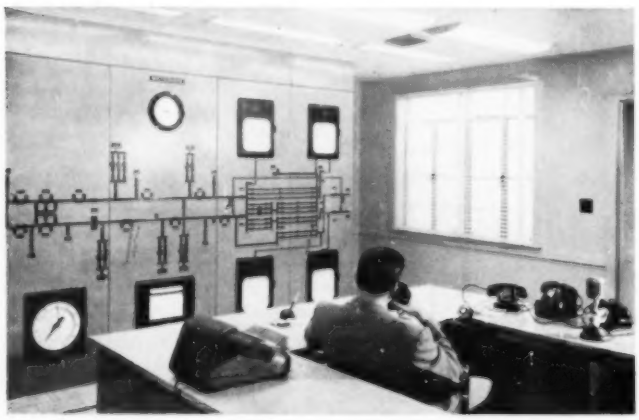
tions requirements of the power companies for several years, but it had limitations. The frequency range soon became saturated in many areas and the addition of new "drops" on the carrier circuits made attenuation a serious problem, particularly in providing relatively long-haul communications.

Today, with the constant increase in power usage, and improvements in the transmission of electric energy, larger and more economically operated power plants are being located nearer to sources of fuel supply. Power companies are interconnecting to form power pools for the exchange of power, and the complexity of communications requirements has multiplied.

Such interconnections, properly controlled by high quality, extensive, and often complex communications systems, permit pooling of reserve capacities and provide a maximum degree of reliability of power to individual plants or areas. By coördination, deficient supplies of power in one area can be supplemented by surplus supplies from other power plants in the interconnected network. The peak loads in different areas usually do not occur at the same time. This is principally due to differences in time zones and differences in the load demand because of load and occupational diversity in various areas.

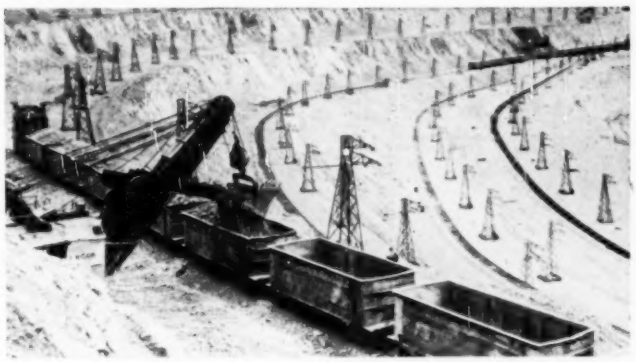
Wilmington, Delaware, and Atlantic City, New Jersey, exemplify the benefits gained through the flexibility of power pools. During the day, generating stations produce huge quantities of power for Wilmington industries. At night, when these industries shut down, the output of power is available to light up Atlantic City's gay white way, its hotels, boardwalk, and piers.

In many sections of the country today, interconnection of power companies is an accomplished fact, and in some areas plans are being developed to interconnect such systems with one or more similar interconnected systems. Multi-company enterprises have also been created, such as Electric Energy, Incorporated, in Illinois, and the Ohio Valley Electric Corporation, for the sole purpose of supplying bulk power at a given location—more power than one company could supply by itself. These power pro-



The district superintendent of a large pipe line watches the indicators on a control panel which report valve and pressure conditions at a remotely controlled measuring station nearly 60 miles distant, while he talks to gas control headquarters 1500 miles away. Through telephone facilities he can dial into five similar stations to obtain like information or to open and close valves

ducing organizations are supported by a spider web of channels for voice and written communications, telemetering (transfer of measurements from a remote location), and protective relaying (arrangements to protect the power system during occurrence of trouble conditions). Channels are also required for supervisory control (supervision and control from a central point of a number of functions at one or more remote locations) and frequency and load control (automatic signals transmitted over a communications channel to regulate power generation).



The engine of this train is one of 18 in an open-pit copper mine operation whose movements are directed over Bell System private mobile telephone equipment

The 1952 construction expenditures of investor-owned electric power companies throughout the United States amounted to 2½ billion dollars, and the industry's post-war outlays for new plants and equipment now total approximately 13 billions. The construction budgets of the companies for 1953 aggregate almost three billion dollars, and by the year's end nearly 50,000,000 customers will be using these services. In view of this rapid growth and the increased usage by all customers, the power industry has estimated that it will require a ten-fold increase in communications facilities in the next five to ten years. The large amounts of capital required for such expansion and the increasing complexities of the communications systems required have led more and more of the power companies to decide against providing their own communications facilities. Furthermore, power-line carrier communication systems have limitations as to capacity and freedom from interference which tend to restrict their general expansion. The telephone companies, realizing the needs of these customers, are working closely with them to provide the best communications facilities obtainable.

As an example, one of the Bell companies recently executed an agreement with a large hydro-electric power system to take over its entire private communications network, and to provide for all future requirements. The customer's telephone plant is a substantial telephone system, and will be assimilated over a period of five years. It includes some 10,000 stations and over 15,000 miles of physical telephone circuits.

Internal Communications for Railroads

UNLIKE THE pipe-line and power companies, the railroads almost from their earliest beginnings had a right-of-way communications requirement.

The expansion of the railroads was coincident with the invention and development of telegraph service, and each complemented the other. The railroads required wire communication in order to operate effectively, and the telegraph industry required lines between cities and towns. As the railroads were being built, telegraph lines were strung parallel to their rights of way. In return for the use of the right of way, wire facilities were allocated to the railroads for their exclusive use.

In time, the railroads paralleled the telegraph facilities with telephone channels, building up complex communications systems which today represent a total investment of hundreds of millions of dollars.

With the increasing costs of operations and the need for large amounts of capital to introduce more efficient and economical equipment and methods, railroads are taking a new look at their communications requirements. Mobile radio systems are being used to facilitate switching in yard operations, train-to-train, end-to-end of train, and train-to-wayside communications. In several cases, industrial television is under trial for checking freight car numbers and the condition of cars and equipment on moving trains. The telephone companies have long coöperated with the railroads in working out solutions to their communications problems, and are prepared generally to offer whatever communications facilities they need.

This engineer of a diesel locomotive is receiving instructions from the yardmaster over mobile radio telephone facilities leased from the telephone company

Opportunity and Challenge

SINCE THE public interest is so heavily at stake, the communications circuits of pipe lines, power companies, and railroads must provide dependability and continuity of service. For example, if a communication circuit is interrupted even for a short period, the flow of gas or fuel oil to a community through a pipe line might be curtailed, or the flow of electric power to a community significantly altered, or the continuity of train operations affected.

The telephone companies recognize that utilities need high-quality reliable communications. They are using all their "know-how" in special preventive maintenance and are employing new and better circuits and devices as they become available. They are insuring a high continuity of service by careful planning of alternative routings in the event of interruptions. Telephone company plant and commercial people frequently visit critical points of operation to observe the

condition and operations of telephone facilities. They are seeking to learn at first hand the customer's needs, and the reaction of field people to the service being furnished.

Pipe lines, power companies, and railroads have unusual communications requirements because of their long rights of way through territory which is sometimes remote and relatively inaccessible, where telephone companies may not be operating. In earlier days, frequently the only practicable way of meeting these requirements was for the so-called right-of-way companies to provide their own communications along their rights of way—interconnecting with telephone company facilities, under operating agreements, as required.

Over the years, however, telephone company facilities have expanded tremendously—particularly since World War II. The Bell System now has more than ten times the toll circuit miles in its plant that it had in 1925, and about four times that of 1940—or over 30,000,000 miles. Whereas in 1925 over one-half of the plant was in open wire, today open wire comprises less than one-fifth of the mileage. Of the circuit miles in cable sheath, about 70 per cent is underground. Not only is the network more extensive but it is more reliable. The telephone companies are in far better position today to supply the services needed by utilities, and desire to do so to the fullest extent practicable.

Using the Best "Tools"

TO PROVIDE BETTER COMMUNICATIONS, the telephone companies are endeavoring to meet individual requirements with the "tools" that will furnish the best and most dependable service at reasonable cost to the customer. One of these many "tools" is radio, a relative newcomer.

The dispatcher of a large natural-gas pipe line company receives hourly pressure time reports from gathering, compressor, and metering stations

In the field of point-to-point radio, microwave is proving of great value in providing communications, especially over long hauls where large numbers of circuits are required.

The Bell telephone companies have had extensive experience with radio relay. The Bell Laboratories have designed the systems which are being used on the trancontinental and other long routes to provide television and other communications channels. These systems are manufactured and installed by the Western Electric Company, and the Bell System Companies engineer, operate, and maintain them. By the end of 1952, the telephone companies had more than a million miles of telephone circuits over radio relay.

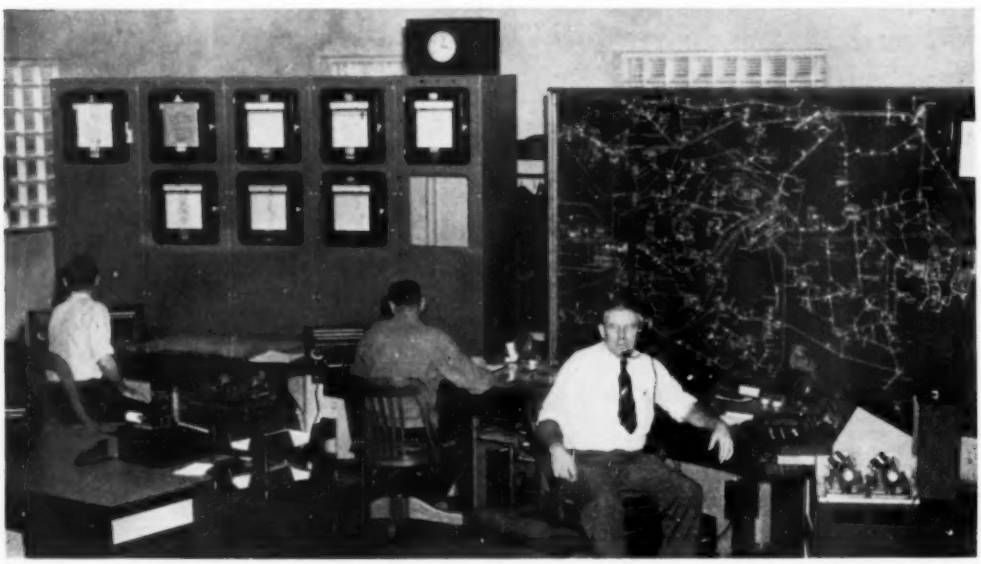
The Bell telephone companies also use microwave radio systems over routes where hauls are short and channel requirements are small, in cases where this appears to be the best

method of furnishing the desired service, considering both reliability and cost. In addition, little brothers to the Bell System transcontinental radio relay system in the VHF band provide telephone service to a number of remote locations where only a few channels are needed. For example: two toll stations provided by VHF were used to serve a new petroleum field in Utah which an oil company was undertaking to "prove in." The area was 77 miles from the nearest wire telephone lines.

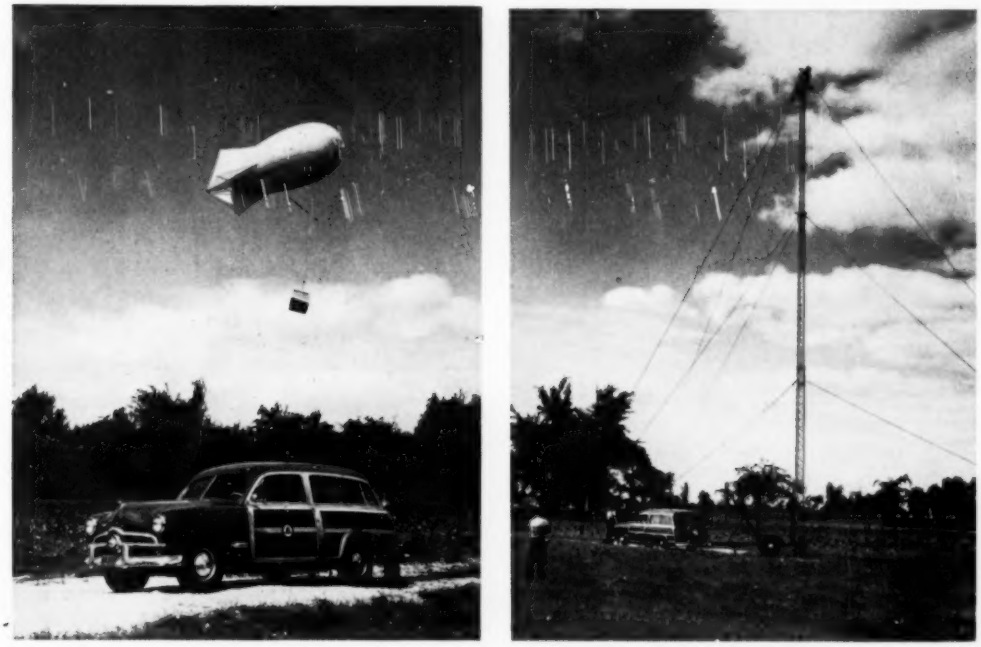
Several Bell System companies have also made radio installations paralleling open wire lines, to provide added circuits. Since radio circuits are subject to hazards quite different from those affecting wire facilities, this diversification of facilities provides added protection against service interruption.

Microwave radio is a fast-changing art, and obsolescence is a factor to be considered before selecting it as the "tool" to do a particular communications job. As an example, since the installation of the New York-Boston radio relay system in 1947—the first successful long-haul system—there have been changes in the antennae, new types of vacuum tubes have been developed, new circuit and equipment arrangements have been designed, and changes have been made in the gas pressure systems used on the wave guides. This all has happened in less than five years, and undoubtedly the years ahead will bring many new developments.

The Bell telephone companies feel that microwave can play a real part in providing communications. However, it is only one type of facility among many. The art is developing and changing rapidly and there are many cases where other types of facilities prove best suited to meet the particular communications needs.



The dispatching turret in the right foreground was especially designed by the telephone company to meet the requirements of a large power company



Bell System engineers use a balloon and a portable tower to select sites for microwave radio telephone stations for a private-line radio telephone system being installed for a major power company

The telephone companies are also extending their cable network at a very rapid rate, using both coaxial and multi-conductor types. While this radio development has been taking place, continuing progress has also been made on improved types of carrier current systems, some of which have been designed especially to provide small numbers of circuits—4 to 16 on an open wire pair and 4 to 20 on a cable quad. These systems are well adapted to meet the expanding requirements of oil, pipe line, transportation, and utility systems by providing additional capacity on wire or cable routes. Furthermore, these systems can be used for integrated wire and radio arrangements in which the carrier currents are transmitted part of the way by wire lines and part by radio without interposing carrier terminals at the junction of the wire and radio systems. This type of arrangement allows great flexibility in the selection of the type of facility for a particular situation.

Beyond the microwave and cable carrier systems, there are other things in the offing. The Bell Laboratories are conducting research work on a new system, for instance, which may provide even greater band widths than do present radio relay systems. This is an extremely-high-frequency wave guide system which may make possible the transmission through hollow pipe of a band width of several thousand megacycles over long distances. Progress in research continues to resolve problems that must be overcome before the wave guide

can take its place alongside the paired cable, the coaxial cable, microwave transmission, and similar facilities.

As these new developments occur and prove economically attractive, the telephone companies incorporate them into their plant as rapidly as they become available. Telephone company customers thereby automatically benefit from improvements in the communications art.

Mobile Radio Widely Used

MOBILE RADIO FACILITIES have become very important to utilities, increasing the flexibility of operations both in cities and along their rights of way. In addition to the general mobile telephone service, now available to some 12,000 vehicles—including water craft, locomotives, and heavy movable equipment—the telephone companies also provide private mobile radio systems, and have 500 such systems under contract, serving nearly 7,000 mobile units—about 40 percent of which are furnished to utilities.

Provision by the telephone companies of the best "tools" includes not only the circuits used to carry the communications but also specially built instrumentalities and specially designed circuit arrangements, such as switchboards and dispatching turrets, selective signaling equipments, special circuits for remote control and metering, and similar items.

One recent example is a newly designed dispatcher's turret soon to be installed for the Bonneville Power Administration. BPA had a requirement for a dispatching turret small enough in size to be operated by one man but capable of handling 80 to 100 lines with a number of special operating features. Since such turrets might be used in other power-company situations, engineering work by a team of Pacific Telephone and Telegraph Company, American Telephone and Telegraph Company, and Bell Laboratories experts, in consultation with BPA, was rushed to completion. The Pacific Company arranged to assemble the equipments locally. Later this turret will be standardized and made available through Western Electric for other customers with similar needs.

In several cases, pipe-line and power companies are being furnished circuits and selective signaling arrangements for remote control and metering purposes. As a result, dispatchers at one location can select and read meters, start and stop pumps and motors, open and close valves, and obtain indications of switch positions at several distant points. In fact, they can do remotely just about anything human beings on the spot can do. These developments constitute further evidence of the desire of the telephone companies to help these customers.

Ringing Door Bells

RECOGNIZING the importance of better communications, telephone company representatives made 33,000 visits during 1952 to the pipe lines, power companies, and railroads to offer them assistance in meeting their changing communications requirements. Such visits have been supported by telephone company officers and operating heads who have, through personal contacts with executives of the utilities, affirmed the desire of the telephone companies to

meet their communications needs fully.

As a result of those efforts, comprehensive studies of message traffic and operational requirements are now under way with more than 100 major pipe lines, power companies, and railroads. These studies are designed to help the customer obtain the best use of exchange, toll message services, and private line facilities.

A study recently completed for one of the largest petroleum enterprises in the United States resulted in a decision by its management to sell its communications plant to the telephone companies and to "lease" facilities for all future requirements.

Why Bell Service?

THE TELEPHONE COMPANIES offer a dependable and economical communications service. Rates are reasonable, and the utility "leases" only the services it needs as it needs them, tailored to its individual requirements. There is no need to invest capital in communications equipment, set up reserves for obsolescence, and provide manpower for engineering, installation, and maintenance. Furthermore, changes in the customer's operational requirements will not leave him with facilities he no longer needs—as is sometimes the case when he owns his communications plant.

One power company executive stated recently that there are many advantages offered by coördination of utility communications with the telephone companies. It avoids duplication in plant, results in saving in space requirements and in use of critical materials, improves reliability (e.g., greater number of alternative routes made possible), provides much greater flexibility, and gives undivided control of communications and greater convenience. The power company can take full advantage of Bell technical advances and its own personnel can be assigned exclusively to the company's "bread and butter" job.

Whether a utility carries oil or gas, electric power, passengers or freight, it is in the transportation business. And, for that matter, so are the telephone companies whose channels reliably transport the operating intelligence for these basic industries. Both have come a long way together since the day mother used to trim the wicks and fill the "coal oil" lamps. Together, these specialists, each in his own field of accomplishment, are helping each other to meet the challenge of greater usefulness.

Customers Now Pay Well Over $600,000,000 a Year in Excise Taxes on Telephone Service Furnished by the Bell System Companies

"... Subject to 25% Tax"

Donald A. Dobbie

MANY YEARS AGO, Benjamin Franklin wrote that "Our Constitution is in actual operation; everything appears to promise that it will last; but in this world nothing is certain but death and taxes." Happily, since that time advances in medical science have added many years to our lives. Not so happily, the increasing complexities of our world today have added many dollars to our tax bills.

Probably the most difficult task which confronts our Congress each year is the job of determining the amount of taxes which must be collected and the manner in which these taxes may be raised. While this article proposes to discuss only one particular form of taxation—the 15% and 25% Federal excise tax which telephone companies are required to collect from their customers on charges for local service and toll calls —let's first take a quick look at the size and make-up of today's Federal tax structure, to see just where these excises fit into the picture.

For 1952, the Federal Government's internal revenue collections were derived from three principal sources: corporation income and profits taxes ($22.1 billion, or 32%), individual income and employment taxes ($36 billion, or 53%) and miscellaneous internal revenue taxes ($10.4 billion, or 15%). The miscellaneous taxes, while including such items as estate and gift taxes, consisted primarily of the various excises on alcoholic beverages, tobacco, manufacturing, entertainment, transportation, communications services, and other items, and the retailers' excises on furs, jewelry, luggage, and toilet preparations.

The main premise underlying most of these taxes—corporate, individual, and miscellaneous—is relative ability to pay. Corporations having surtax net incomes of more than $25,000 pay at higher rates than smaller corporations; individuals pay at rates which are on an ascending scale in proportion to their earnings and in-

come. Historically, most miscellaneous taxes have been levied on articles which are not strictly necessities, and the rates have been scaled so that, by and large, the higher rates apply only to so-called luxury items.

In other words, excise taxes are not levied on such fundamental day-to-day living costs as rent and housing, food, water, gas, electricity, clothing, drugs, and carfare. Rather, they are placed on such commodities and services as alcoholic beverages, tobacco, theater and cabaret admissions, furs, jewelry, gasoline, automobiles, and electric appliances. In most cases, the commodities and services subject to these excises, while contributing to our standard of living, could in time of necessity be eliminated or their use materially curtailed without impairing the health, safety, or well-being of the community. These products are not all luxuries, but most of them (particularly the ones in the high excise brackets) are definitely not essentials. To this extent, the excise taxes on these products follow the basic theory of ability to pay.

The outstanding exception to this premise is the excise tax on telephone service.

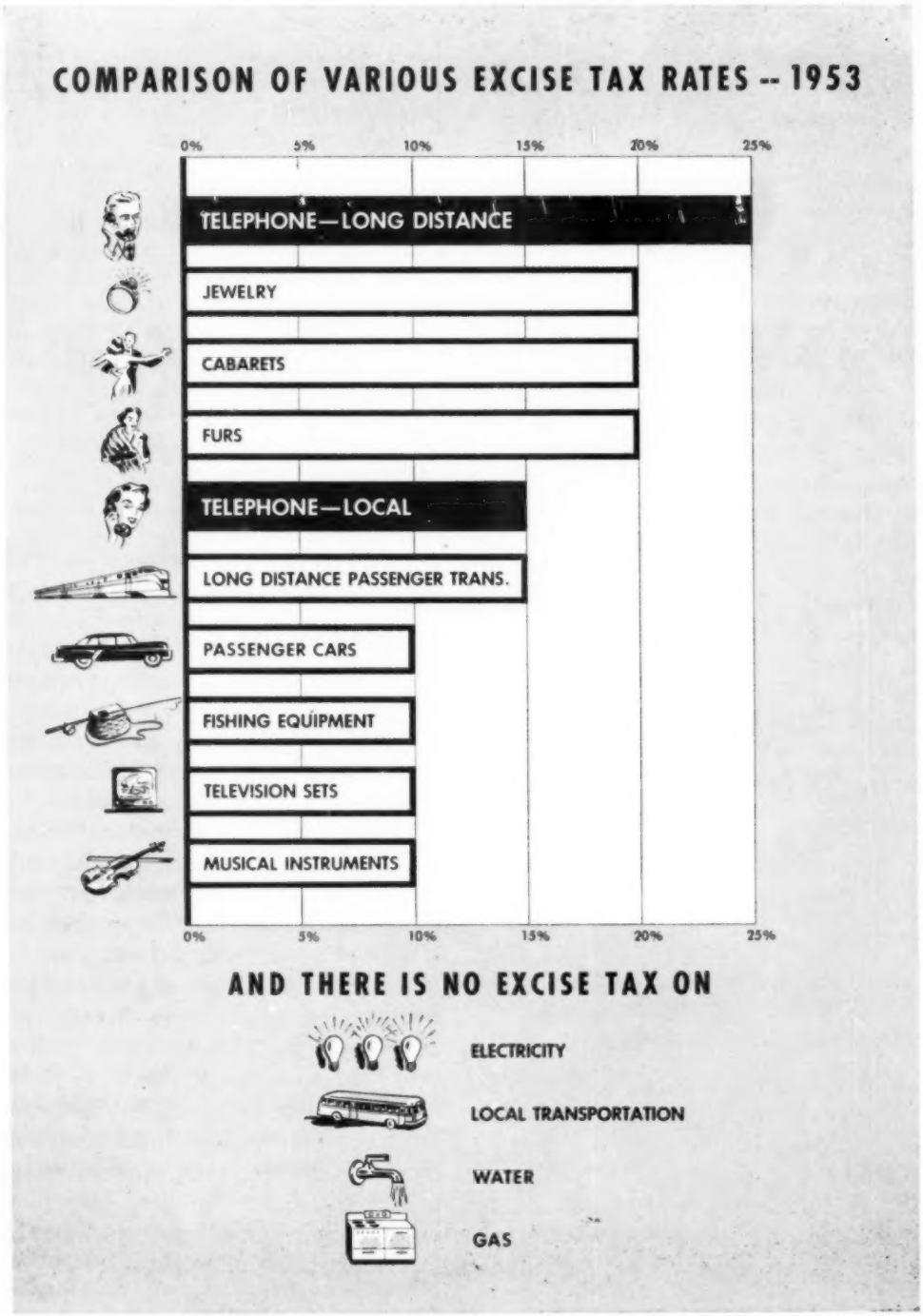
For 1952, the operating companies of the Bell System collected and turned over to the Federal Government $615 million in excise taxes. For the same period, the companies paid on their own operations some $706 million in Federal, state, and local taxes. The tax portion of the amounts collected from telephone users, therefore, amounted to well over a billion and a quarter dollars—an average of $2.85 per telephone per month—of which 47% (the excise tax portion) entered in no way into the cost of furnishing telephone service.

Telephone Excise Tax Highly Discriminatory

IN THE regulated public utility field, bills for electricity, gas, and water are not subject to Federal excise tax. Neither are charges for local and short-haul transportation, including taxicab fares and commutation tickets, although comparable local and short-haul telephone service is taxed at the high rate of 15%. The tax on long-haul transportation of persons is considerably less than the tax on long distance telephone calls—15% as compared with 25%. In the communications field the Congress found it desirable recently to reduce the excise tax rate on telegraph service—an industry which, like telephone service, is essential to national defense—from 25% to 15%.

The discriminatory nature of the telephone excises is even more sharply revealed when the rates are compared with those on so-called luxuries. Only alcoholic beverages and tobacco are taxed at rates higher than the 25% applying to telephone toll messages over 24 cents and to leased wires. Cabaret admissions, jewelry, furs, and cosmetics bear a smaller excise burden. The 15% on local telephone service is greater than the excises applying to television sets, passenger automobiles, musical instruments, and air-conditioning units.

Most people agree that telephone service today is a necessity, not a luxury. At the end of 1952, some 67%


COMPARISON OF VARIOUS EXCISE TAX RATES -- 1953
0%
5%
10%
15%
20%
25%
TELEPHONE—LONG DISTANCE
JEWELRY
CABARETS
FURS
TELEPHONE—LOCAL
LONG DISTANCE PASSENGER TRANS.
PASSENGER CARS
FISHING EQUIPMENT
TELEVISION SETS
MUSICAL INSTRUMENTS
AND THERE IS NO EXCISE TAX ON
ELECTRICITY
LOCAL TRANSPORTATION
WATER
GAS

of all households, representing more than one hundred million people, had telephone service. Over the years the telephone has become firmly established in the peace-time economy of the nation. We depend on it in most of our normal business and social transactions, as well as in emergencies —to call the doctor, the fire department, the police. Its importance in times of national emergency is so well recognized by both the government and the public that it need not be stressed here.

The telephone excises reached their present peak with the imposition in 1944 of what were termed "war tax rates" by the Congress, and it was provided in the law that such rates were to expire six months after the end of hostilities. These rates were imposed at that time largely to discourage the use of telephone service and to conserve the then existing facilities for war-time needs. It is plain that the need to discourage the use of telephone service no longer exists. Since the end of the war the number of telephones in the United States has increased by 72%, and the Bell System average telephone plant investment has more than doubled. However, the "war tax rates" were continued by the Congress in 1947 without definite termination date.

Of Concern to Customers, Companies, and Commissions

LET'S SEE WHY we, as members of the telephone industry, should be concerned about these taxes—which, after all, are taxes levied directly on our customers, not on the telephone companies.

The cost of any product or service includes not only such expenses as labor, material, and overhead, but also any Federal, state, or local taxes levied on the companies involved in providing such products or services. In the case of telephone service, however, the customer is required to pay a large additional charge—the excise tax—which does not enter in any way into the cost of furnishing such service. This additional amount is specifically identified on our telephone bills, and yet it is difficult for the telephone user to think of his bill as being made up of two amounts, one of which represents his cost of service, the other an additional tax superimposed on the bill and turned over by the company directly to the Federal Government.

With the continually increasing demand for telephone service, we are in constant competition with other industries for the capital—money—to finance the improvement and expansion of our service. We have been forced to apply for increased rates not only to meet today's inflated costs but to provide the earnings so sorely needed to attract the necessary additional capital to the industry on fair and equitable terms. The effect of Federal income taxes on our rate structure is well known to both the companies and the state and Federal regulatory commissions: the fact that in order to obtain a dollar of earnings for our investors we must, at the present 52% tax rate, be permitted to collect $2.08 from our customers, of which $1.08 will go to the Federal Government in tax.

This 52% Federal income tax rate is certainly high, but it applies to all large industries—not just telephone companies. Where telephone service

is singled out for discriminatory treatment is that the companies furnishing such service are required to collect from their customers an additional charge which increases the amount individuals must pay for that service but which has nothing to do with the cost of rendering the service. This is the reason why we in the industry should be and are concerned about the telephone excise taxes.

This problem is also of great concern to the regulatory commissions. Although the excise taxes are not directly considered in telephone rate cases, the commissions cannot help but realize that whatever charges they approve will be increased by fifteen or twenty-five per cent through the application of these taxes. At the meeting of the National Association of Railroad and Utilities Commissioners last fall at Little Rock, Arkansas, this matter was considered so vital that the convention passed a resolution stating that ". . . the present excise taxes on communication services are inimical to the maintenance of reasonably priced and non-discriminatory communication services and that, accordingly, the excise taxes on communication services should be repealed or greatly reduced."

Phone Users Not Fully Aware of These Taxes

THE FACT that the telephone user does not realize the effect that these excises have on his cost of service is borne out by a nation-wide survey of telephone customers which was made last year. Less than one in five of the people interviewed knew the excise tax rate on toll service; nearly half of them didn't know whether any excise tax at all applied to such service.

The Bell System companies have often pointed out the impact of these taxes on our customers and, as stated in the A. T. & T. Annual Report for 1952 ". . . we shall continue to present to the taxing authorities our views as to why and how this burden should be reduced." We feel an obligation to our customers to do this. It is also our responsibility to do everything we can to make our customers themselves aware that they are at the present time forced to bear this discriminatory tax load as a part of the cost of telephone service.

Index Now Available

AN INDEX to Volume XXXI (1952) of the BELL TELEPHONE MAGAZINE may be obtained without charge upon request to the Public Relations Department, American Telephone and Telegraph Company, 195 Broadway, New York 7, N. Y.

About 300 Bell System Plant Schools Complement On-the-Job Training to Help Many Thousands of Employees Acquire Or Improve Craft Skills Each Year

Learning How To Do It Through Plant Training

Walter H. Flinn

IN THE PLANT DEPARTMENTS of the Bell System companies there are 190,000 men and women who plan, build, repair, and maintain the wire, cables, switchboards, and a host of other types of equipment, used in providing communications services. That is a big undertaking and a big responsibility, and all of these folks must know what they are doing. In fact, all of them must be *trained* in the knowledge and techniques of certain operations which keep the business going.

In the old days, a man became a skilled craftsman the long, hard way: through trial and error. Today there isn't time for that. Needed skills, basic crafts, and progressive accomplishments are acquired by being trained in them: trained systematically, intelligently—yes, even scientifically.

The purpose of training is to reduce the time required for learning, to improve the quality and quantity of production, and to promote safe working practices. Training is also an important factor in maintaining good public relations.

During the early years of this business, foremen hired and fired men on location. An applicant's climbing ability was indicated by his possession of "hooks." Not until the 1920s did the young apprentice receive much formalized training. Since this time, the need for sound training methods has been recognized. If a training program is to accomplish the desired results, the training must be tailored to fit the objective. Good training material cannot come from a haphazard collection of opinions, nor from experiences of any one individual, but must be based, instead, on extensive research into the most efficient methods for the particular task.

This doesn't mean that we don't have to practice over and over again, for we do; nor does it mean that we

learn in a jiffy, for we don't. Much of the training consists of individual instruction on the job, and is planned and conducted by a man's supervisor. But here, let's just see how plant school training works.

A Post-War Recruit

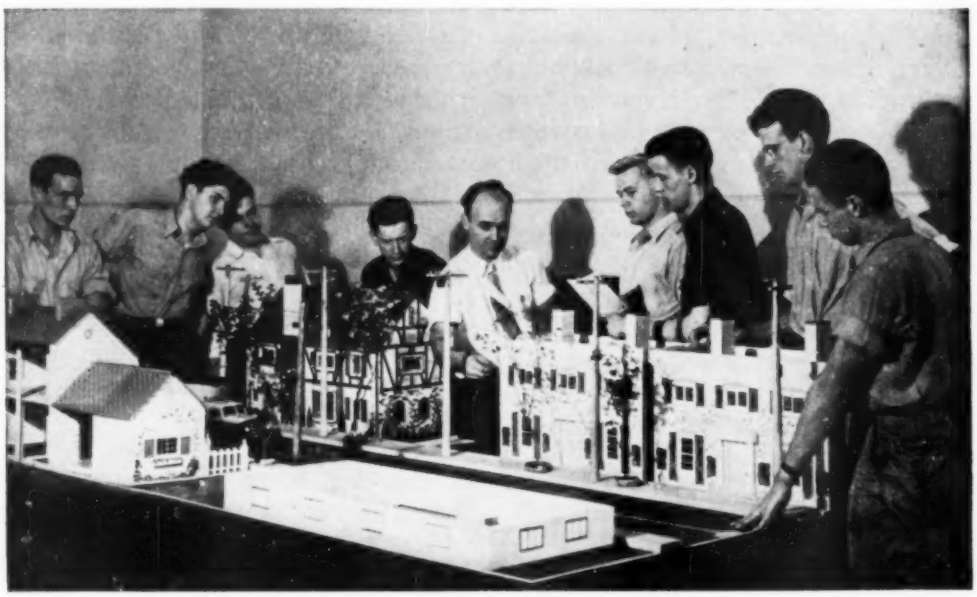
SUPPOSE WE take the case of John Smith, a young World War II veteran who came to the employment office of a Bell System Company in March of 1946.

The young man had received his honorable discharge just a week before. During the interview, he indicated that he had heard a lot about the Bell System from some of the G.I.s who were on military leave from the System. He said from all the things he had heard about the company, he was more than anxious to join its ranks.

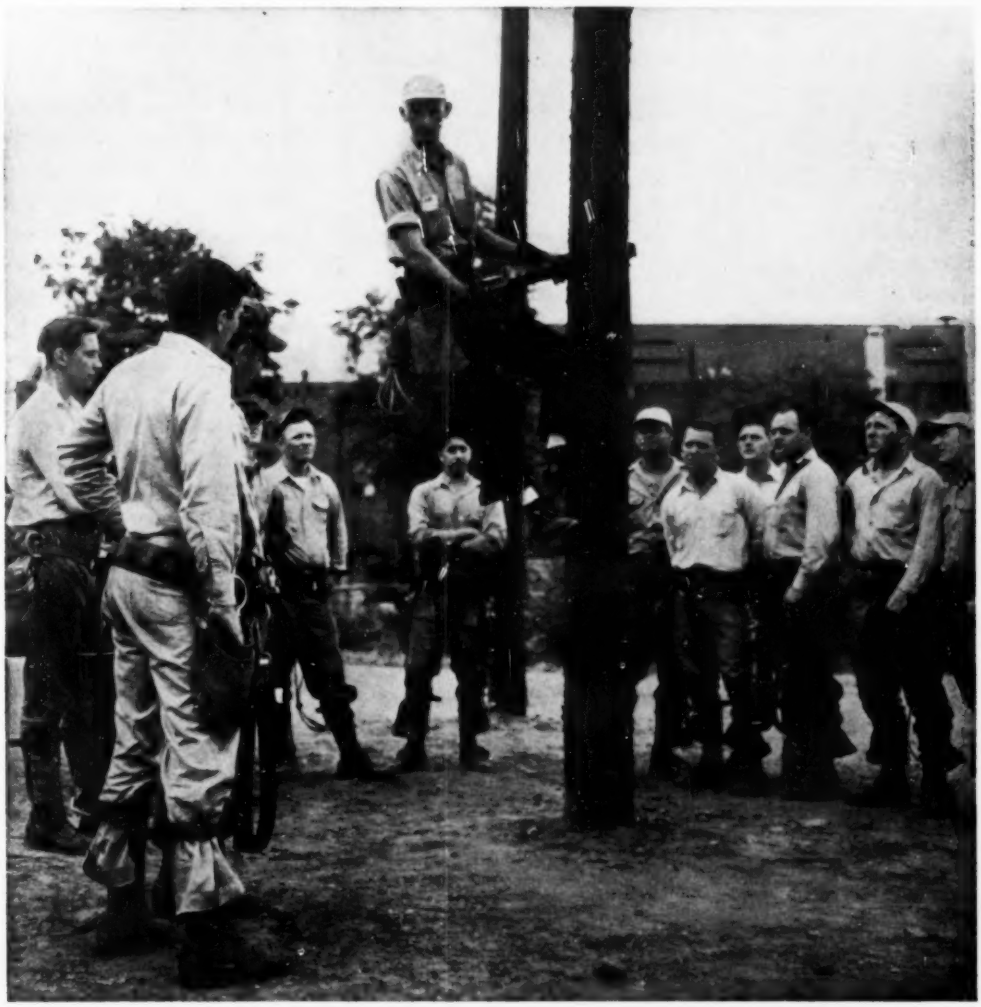
He took the various pre-employment tests and showed up rather well in all of them. He was mentally alert, and had good coördination and mechanical skill. It looked as though John had the makings of a good station installer, and he was told to report to the District Plant Superintendent the following morning.

John was one of 1,500,000 men and women who came to the employment offices throughout the Bell System during the four years following the War. However, he was one of the more fortunate ones—for we found it possible to hire only one out of every 14 applicants who applied for employment during this period.

Needless to say, John was in the District Superintendent's office bright and early the next morning, full of vim and vigor and rarin' to go. Here John heard something about the Bell System family. He learned about the



A group of student installers make use of model homes in learning to plan residence telephone installations



An instructor demonstrates the techniques of pole climbing. Soon each pupil will be proving his proficiency under the expert's watchful eye

confidence the public has in us, and how proud we are of this reputation —and now that John had become one of the family, how we were counting on him to help us maintain that same kind of reputation. He was told how important it is to be pleasant, punctual, and regularly on the job to help meet our responsibility to our customers.

Here may be seen the early stages of training in action. It is true that John didn't know how to perform any of the work operations yet—but he began to acquire a better understanding of the kind of company for which he was going to work.

The next step in John's orientation program was to meet the foreman to whom he was to report as well as the

Typical residential construction, both exterior and interior, is simulated for these budding installers to practice on

Practical experience with aerial cable operations may be obtained under such favorable circumstances as these

other fellows in the gang. Here the foreman explained in more detail some of the things a station installer has to do in the performance of his work. John was informed that he was to report to the Plant school on Monday morning. There he would be assigned to an installation class with seven other men who had just been employed. He was told that he would go to school for two weeks and, at the end of that time, report back for assignment.

Some phases of the plant work can be taught more effectively in a school, where the learning situation can be controlled and teaching aids can be provided. In the Plant Department, the Plant school plays an important part in the over-all training of Plant people.

One of the first objectives in plant training programs is to orient new men in the business and train them so they will become productive and gain their useful place in the Plant organization as rapidly as possible. Why all the rush? Well, we are talking about the period since World War II, when the companies

have had thousands upon thousands of requests for telephone service. Time was a real factor, for it had been necessary to more than double the 91,000 people in the Plant Departments at the end of the War. But most important of all, it's just good business to train each employee so he will have the knowledge and skill to perform his duties well. One of the real satisfactions in life comes from hearing such words as "A job well done"—particularly when they come from a customer.

Throughout the United States and Canada, over 300 Plant schools have been established to help care for the training needs of the Plant forces. Some of these schools are equipped to teach 50 to 100 different types of courses, and these courses range in length from a half day to 5 months. During 1952 approximately 104,000 Plant employees attended classes in the plant schools for an average of 5½ days each.

Regardless of where training is accomplished, it is a combination of learning and practice drill work. Training, in its broad sense, is never ending, but for practical purposes it is often said that training is completed when correct performance, both mental and physical, becomes habitual.

Many Kinds of Training

THE PLANT SCHOOL to which John and the other new men were assigned has several class rooms. These are very flexible, and various types of training can be conducted in one room, for they are equipped with demonstration boards, visual aids, and actual telephone equipment. In the rooms assigned to installation training are telephone poles and cable and terminal boxes set up just as they are in the field, and sections representing home and office-building types of construction. Everything is done to simulate actual working conditions as nearly as possible.

Training requirements and class schedules within a given area are established at least three months in advance. Instructors are selected from all parts of the Plant Department: installation foremen, repair foremen, construction foremen, central office supervisors, and engineers. They have had actual field experience in the subjects they are teaching, and serve as instructors usually for one or two years. Together they work as a team with a single aim: to turn out well trained telephone people who can do their assigned jobs safely and efficiently.

Some typical training courses:

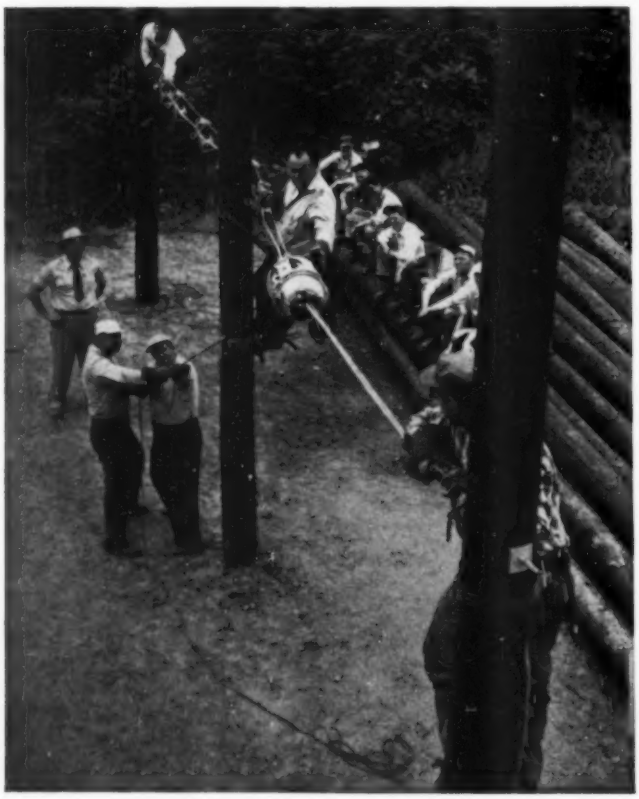
First Aid
Advanced Installation
Dial PBX Installation and Maintenance
No. 1 Crossbar Dial Systems
Cable Splicing
Teletypewriter Maintenance
Ship-to-Shore Radio
Television Radio Transmission
N1 Carrier System

Let's look in on the installation class and see how John and the other new men got along on their first day in school. The subject they were discussing was Public Relations—and here's what the instructor was saying about it:

"Our relations with our customers and the public are controlled largely by the things we do as employees of this company. The opinions the public and our customers get in a great number of cases come from the actions of our employees both on and off the job. Quite frequently the only contact our customers have is through our installers and repairmen." They then discussed some of the things installers should do in their everyday job to promote good public relations, and the importance of being courteous, neat, and business-like at all times.

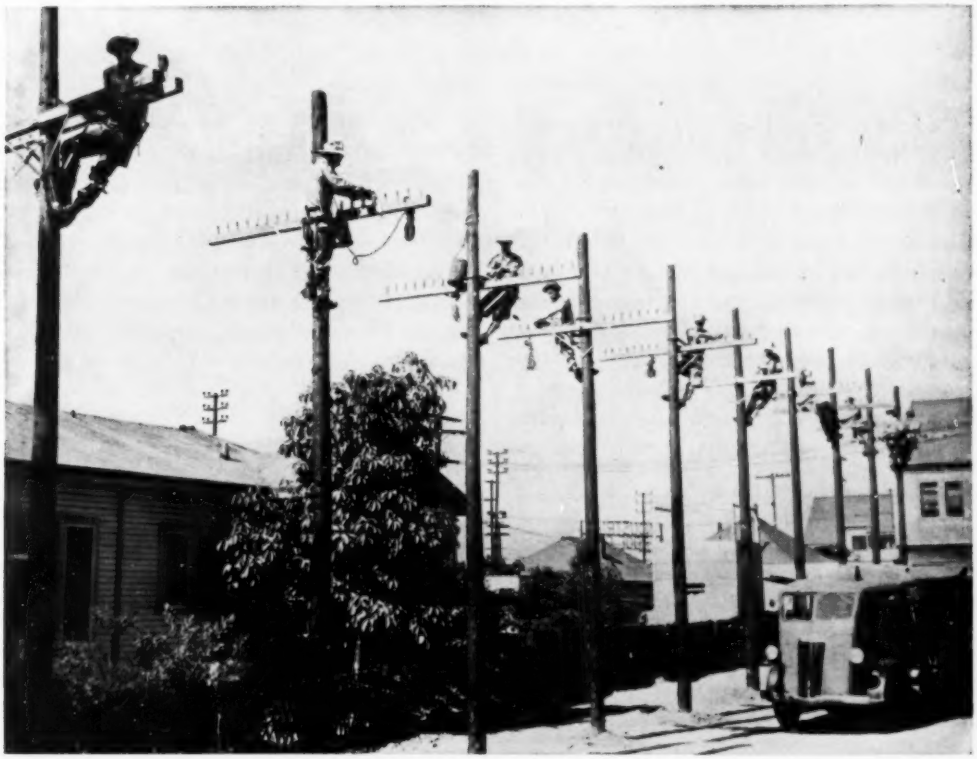
The next subject they discussed was safety, and the instructor explained the meaning of the Bell System Creed: "No job is so important and no service is so urgent that we cannot take time to perform our work safely." He also pointed out that the responsibility rests with the individual to make his own working conditions safe. He told the group that as they covered each phase of the job he would point out the safety features involved, because they are as important as the work item.

That brought them to the service order, and its relationship to the installation job. It didn't take the members of the class long to realize that the service order is the instrumentality which conveys the desires of the customer, and that the installer is a member of the team that will install the telephone to the customer's exact requirements. The instructor explained the part which each department contributes toward executing the service order, and again the men realized that the telephone job is one of teamwork, with each member occupying a very important post on the telephone team.



Necessary skill in the use of a cable lasher may be gained in plant school

At the end of the first week John and the rest of the class were amazed at the number of things they had learned in such a short time about the tele-



Practice in climbing and working on poles, acquired in school, brings confidence aloft

phone business. In addition to holding discussions, they were actually learning how to run wires, install telephones, and even climb telephone poles.

How to Climb a Pole

PERHAPS we had better go back to the morning of the second day of the installation class, when the instructor asked "How many of you fellows have ever climbed a telephone pole?" Several of them indicated that they had done some pole climbing while in the Armed Forces.

The instructor told the class that during the two-week period they would devote part of each day to learning how to climb, and introduced the boys to what is commonly referred to as "hooks," or lineman's climbers. He explained that they were used for climbing and when working on unstepped poles, and that they should not be worn when not required. He emphasized that their very lives would depend upon these climbers, and assured them that the climbers were made to particular Bell System specifications, determined as a result of long years of experience in both field and laboratory testing.

The class was shown how to sharpen and gauge the gaffs of the climbers, so they would always be in top-flight condition. Then each man

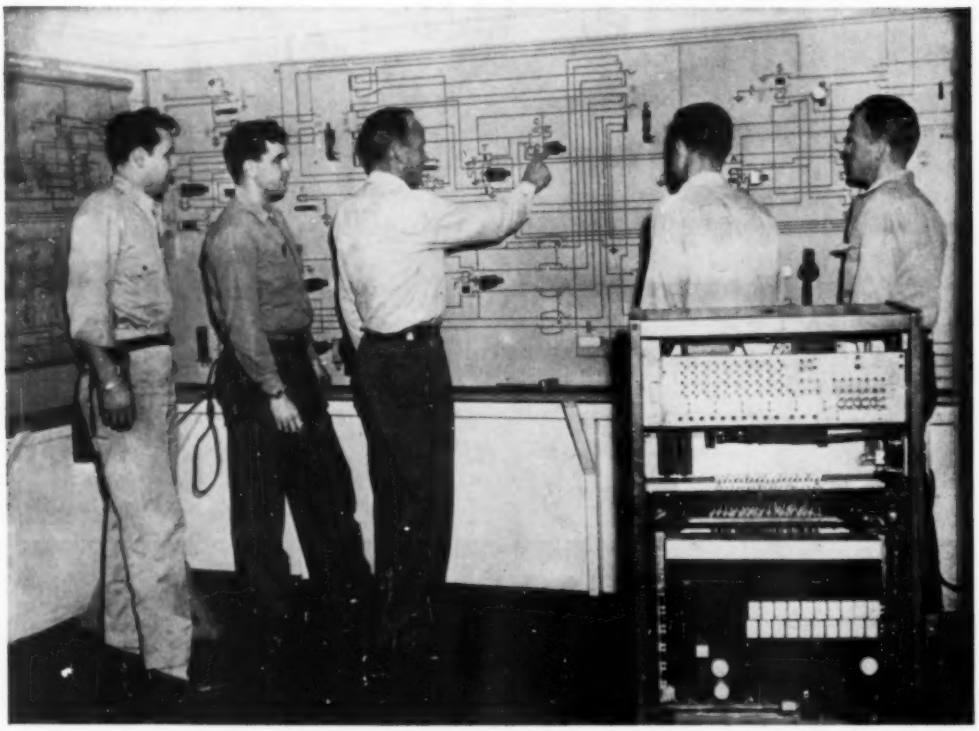
How to Climb a Pole

John was instructed that the length of the first step should be about 8 inches from the ground. He was to keep hips, shoulders, and knees a comfortable distance from the pole and to apply sufficient pressure to force the gaff into the pole. (The weight of the body is usually sufficient.) He was then to proceed to raise the body into position for the second step. The hand on the side of his body on which the leg was moving up was raised slightly before the foot. After the second gaff is placed, the first gaff is removed from its position in the pole by shifting the weight to the other leg and lifting the gaff out of the pole. The free gaff is then raised upward for the next step. Short steps are taken when one is learning to climb. The distance between steps will lengthen naturally with practice. The same principles apply for descending the pole; the weight of one's body should ordinarily be sufficient to set the climber gaffs securely when descending.

was measured for his climbers, and taught how to wear them properly.

The next phase of climbing instruction was given outside, in a yard next to the plant school. Here poles had been placed in conditions simulating real field conditions.

Before any man could learn to

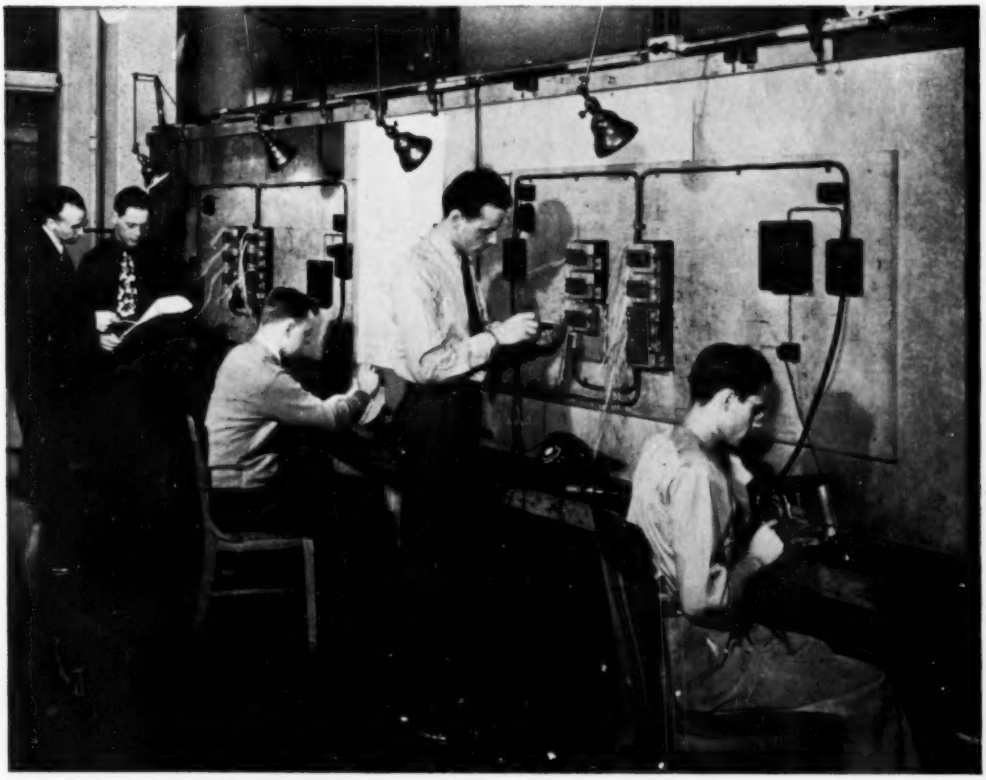


Circuit layout is an important feature of PBX work

climb a pole successfully, the instructor stressed, he must have confidence in his ability to learn to climb and in his climbing equipment. The instructor demonstrated the correct techniques by climbing repeatedly up the pole about three feet and down again. Then he asked each man to stand at the base of one of the poles without his climbers. Each was instructed to place his feet against the base of the pole at about a 45° angle, with the side of the arch of each foot against the sides of the pole. Then he was instructed to extend both arms forward in a horizontal plane from the shoulders, grasping the pole with both hands, and thrusting his hips well back from the pole with legs and arms straight. He was taught to move his legs up and down as though he were actually climbing a pole. (These exercises are very important, for they limber up muscles which are not ordinarily used.)

Now the men were ready to put on their climbers. At first they felt quite awkward, for they had to learn to walk with their legs spread far enough apart to prevent the gaffs of the climbers from cutting their feet or legs.

The instructor selected John as the first member of the class to climb a pole. The other members of the class gathered around the pole to watch. Then each man was given the same instructions as John and the opportu-



Learning to install key equipment is an advanced step in craft training

INSTALLATION CURRICULUM

The two-week course in installation for new employees, which John completed, included such items as—

Selection of Tools and Materials
Bell System Practices
Placing Drop Wires
Placing Inside Wires
Standard Telephone Set Installation
Service Orders and Work Reports
Pole Climbing

nity for practice. And, like John, none was permitted at first to climb higher than three feet above the ground. By the end of the two weeks, every man in the class could climb to the top of the pole and descend with confidence. Yet it is only through much additional training and supervision on the job, by a man's foreman, that he will develop into a skilled installer.

During the two-week period John and the other members of the class had learned many things about the installation job. Through discussion and practice, they had also caught something of the spirit and tradition of our business. Now the initial training was over. It was time to go to work.

John and his seven fellow students returned to their installation foremen. For the next couple of weeks, he went out with an experienced installer, watching, helping, gaining experience. Soon came the day—and the thrill of pride—when John received a truck of his own, and, in company with his foreman, tackled his first assignment.

In the months that followed, his foreman continued his on-the-job training, following up, inspecting, and giving John instruction and help and encouragement, until he was satisfied that John was a competent member of the Bell System team.

Use of a relay test set is being demonstrated by an instructor in a plant school

Keeping Pace with Progress

AN IMPORTANT training objective is to keep pace with the technological changes and improvements in the communications art. In a business such as this, where these are occurring almost continuously, it is very impor-

These technicians are being coached at a regional Plant school in the operation of the new N1 carrier system

tant that there be people trained to meet these situations. Advance preparation for a new development may begin as early as three to five years before the first commercial installation is placed in service.

A typical example of this is the N1 carrier telephone system. The development of the system began in September 1947, when Bell Laboratories engineers started to design a carrier system for short-haul cable carrier operation. It was to be used for distances of 15 to 200 miles, capable of being applied to exchange cable facilities, at a relatively low cost. The first field trials were begun in July 1948 on the Milwaukee-Madison cable route in Wisconsin. These trials were continued until January 1950, when development had been completed and standard models of the equipment were being produced by the Western Electric Company.

Training entered the picture formally in May 1949, when the first conference on this matter was held. The first System school was held in the Wisconsin Company's territory, in keeping with the principle that training is best accomplished at a location where equipment is readily available for practical work by the students. Two System instructor classes were held, with representatives from 15 areas in attendance. These instructors, in turn, carried out the training in their own companies to meet service dates starting in September 1950.

The original course material was revised in December 1950, using the

experience to date and incorporating new developments in the system. The new material was presented to two additional instructor classes, where 13 areas were represented, during January and February 1951, at Indianapolis, Indiana.

Necessarily, the original training outline was largely theoretical in nature, since the course was written when there was relatively little experience with the operation of the system. Two years later, in June 1952, the System-wide knowledge acquired during the last years of commercial usage of the system was taken into account in a further revision of the course material. The approach adopted in this revision was to tie together the overall system concepts of circuit operation, with emphasis on problems of installation and maintenance, in order to prepare the craftsman more adequately for the job to be done at the central office location, where service and cost are carefully measured.

Thus it can be seen that the preparation for training on a new technological development may start soon after the inception of the research project, and continue until a new system becomes so common as to be included in the regular training for a particular craft. It is necessary to plan well in advance of actual needs in order to have the course material, instructors, and other essentials ready to do their part in the never-ending job of providing better service to our customers at the lowest possible cost.

In all training, it is important to give the reasons "why" as well as the "what" and "how." This encourages an employee to reason things out for himself when he encounters unusual situations.

Long range planning, forecasting training needs for such things as N1 carrier systems, crossbar central offices, and No. 4A switching centers represent but a part of the over-all plant training program.

New Times, New Needs

TODAY, the training demands on the Plant school staffs are indicative of a fabulous era of scientific advances into which the telephone industry is moving. Training requests are now characterized by such new-sounding words as transistors, microwave radio relay, mobile telephone, automatic message accounting, and broad band carrier—to name a few. Such talk, coupled with other expressions of increased service requirements and the need for good technicians, places added emphasis on the importance of the training job.

Training, both in plant schools and on the job, is a powerful instrument for building sound attitudes and good morale. A telephone employee who doesn't know his job feels insecure before customers and his fellow employees. On the other hand, if he is well trained—as was our young man John Smith—he will have confidence in himself and will enjoy the challenge of the tasks he must perform.

Excerpts from the Annual Report for 1952

For many years the Independent and Bell telephone companies have worked together cordially and effectively; the lines of some 5,300 Independent companies serving nearly nine million telephones interconnect with Bell System lines to provide a truly nationwide telephone service. As the needs of the public grow and change, all the companies keep in close touch to solve common problems. A particular point of common interest is to extend and improve telephone service to farmers. Since the war the Bell companies have added more than two million telephones serving customers in rural areas. In addition to working with their Independent company neighbors, they are coöperating also with the Rural Electrification Administration of the Federal Government to help meet farm telephone needs in other areas.

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Close coöperation between the research, manufacturing and telephone operating organizations of the Bell System has had an important effect in enabling us to introduce improvements rapidly and prevent costs from rising higher than they have. The Bell Telephone Laboratories have pioneered development of better equipment. Western Electric has produced it in quantity at prices that mean large savings to telephone users. Telephone company engineers and operating people have devised better ways of using it. The interchange of experience between operator, builder and designer—all of whom are equally interested in improving service—is the best basis for telephone progress.

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With the continuing growth of telephone service, the work of the Bell System touches more and more people—as customers, as owners of the business, and as employees. There are now more than 1,200,000 share owners and nearly 700,000 men and women are employed. These are large figures. They are most meaningful when we remember that they represent that many individual people, and their families, in communities across the nation.

Ours is a home-town business in each community. Good telephone service has grown from the personal concern of telephone men and women to serve their neighbors well. The company's relationship with each share owner also rests on the sense of personal responsibility. And in the planning and supervising of telephone work, as well as in each act of service, it is the individual efforts of employees in each community that spell out our progress. The people of the Bell System turned in a fine performance in 1952. We can be sure that the success of the business will always depend on the experience and skill of the men and women in it, and on our devotion to meeting every telephone need of our neighbors and fellow-citizens who rely on us.

Nine Countries Reported Over a Million Telephones Each And Six Had More Than 15 Telephones per 100 Population At the Beginning of Last Year

The World's Top Countries —Telephone-Wise

Elizabeth Wrenshall

FOR THE THIRD successive year, some four and one-half million telephones were added to the world network, thereby bringing the total number of telephones in service to 79,400,000 on January 1, 1952. For every two telephones in the world on V–J Day there were three at the beginning of 1952. Nearly 60 per cent of the world total were in the United States, where, on the average, every three persons had one telephone available to them. In the world outside the United States, every sixty-eight persons, on the average, would have had to rely on one telephone for service.

Each year the Chief Statistician's Division of the American Telephone and Telegraph Company publishes a statistical survey of telephone facilities by countries, entitled "Telephone Statistics of the World."

The data presented here are as of January 1, 1952, and we are frequently asked why there should be a time-lag of nearly a year between the date for which the figures are reported and the date of publishing the bulletin. Collection of any statistics on a world basis involves an appreciable amount of time. In this case, questionnaires were sent to nearly 300 administrations or private operating companies. Time consumed by the post; the fact that for certain administrations data are reported as of March or June, and therefore are not available until later in the year; time required by some of our correspondents to assemble statistics and by us to process them—these account for the fact that this survey which presents data as of January 1 is published eleven months later.

Nine countries reported more than one million telephones each in service on January 1, 1952: United States, United Kingdom, Canada, Federal

Telephones Per 100 Population

January 1	*World*	*Europe*	*United States*
1890	.03	.05	.34
1900	.1	.2	1.3
1910	.6	.6	7.6
1920	1.1	1.1	11.9
1930	1.8	1.9	16.3
1940	2.0	2.7	15.9
1950	3.0	3.3	27.0

Republic of Germany, France, Japan, Sweden, Italy, and Australia. Six of the world's principal countries had more than 15 telephones per 100 of the population: United States (29), Sweden (25), Canada (22), Switzerland (20), New Zealand (20), and Denmark (18). It may be of interest to consider briefly the development of the telephone system in each of these countries.

United States

CONDITIONS were favorable to the early development of the telephone in the United States, the land of its birth.

There were no dense jungles to be conquered, as in South America; no polyglot populace, as in Asiatic countries; and no extensive uninhabited areas, as in the cold northern countries or in Africa's desert regions. The natural resources of the United States, the early industrial development, the high standard of living, the system of free enterprise, our national characteristics, our great market potential—all these have combined to produce a telephone system through which, today, three-fifths of the world's telephones serve our population comprising one-sixteenth of the world's people. The entire telephone industry—research, manufacture, and operation—has been conducted under private ownership in the United States from the beginning. On January 1, 1952, although the Bell System—comprising the American Telephone and Telegraph Company and its 20 principal telephone subsidiaries—operated more than 80 per cent of this country's 45,636,437 telephones, there were about 5,400 other privately-owned telephone companies furnishing service in the United States.

The large metropolitan areas are served by extensive systems. New York City, with 3,349,323 telephones at the beginning of 1952, had more than any foreign *country* with the exception of the United Kingdom. Yet New York had only seven per cent of this country's total telephones.

This situation differs greatly from that obtaining in the majority of large countries. Thirty per cent of the United Kingdom's telephones were concentrated in Greater London. The seven per cent of France's inhabitants living in Paris were served by 27 per cent of that country's tele-

phones. Although our ten largest cities, in the aggregate, had 9.5 million telephones—or more than served all the inhabitants of Middle America, South America, Africa, Asia, and Oceania combined—they had less than 21 per cent of the nation's total. The more even distribution of telephone facilities within the United States is indicative of the good service available to rural as well as to urban residents.

The table on the preceding page illustrates comparative telephone development by decades from 1890 for the World, Europe, and the United States.

United Kingdom

THE TELEPHONE SYSTEM of the United Kingdom of Great Britain and Northern Ireland is owned by the government and operated by the General Post Office, with the exception of the municipally-owned local systems serving the city of Hull and the islands of Jersey and Guernsey.

The telephone was introduced into the United Kingdom in 1878 through private companies, all of which, by 1892, had been consolidated into the National Telephone Company Limited. The government took over the company's trunk service in 1896, and its local service upon termination of the company's franchise in 1912.

On March 31, 1952, there were 5,724,440 telephones in the United Kingdom, of which 99 per cent were operated by the Post Office. The system serving the United Kingdom was the second-largest in the world in point of number of telephones in service. There were 11 telephones per 100 persons. An average of 70 calls per capita were made during the year under report.

Canada

CANADA'S SYSTEM ranked third among those of the world both as regards actual numbers and number of telephones per 100 of the population (22). Of the estimated total of 3,140,000 telephones at the beginning of 1952, 86 per cent were operated under private ownership, the balance by municipal, provincial, or Dominion ownership. Canada reported a higher per capita calling rate for the year 1951 than any other of the world's principal countries, or 378, as compared with 376 for the United States.

Germany

THE GERMAN FEDERAL REPUBLIC—roughly half the size of pre-war Germany—was served by 2,700,104 telephones at the beginning of 1952, which reflects a development of 6 telephones per 100 persons.

An attempt by private interests to secure local franchises in 1876 was unsuccessful. Of Europe's principal countries, Germany was the only one in which the government assumed operation of the telephone system from the beginning. The Director of Telegraphs, Stephan, was extremely interested in the potential practical applications of the telephone. By 1878, he had interconnected by telephone fifteen country post offices which were without telegraph service. By 1880, several thousand telephones had been installed in the post office buildings, but it was not until 1881 that local exchanges were constructed in the Imperial Postal Dis-

trict by the Post and Telegraph Administration.

Prior to the war, Germany's telephone system was the world's second-largest. On January 1, 1952, the system serving Western Germany was fourth-largest. An average of 46 conversations per person was reported for 1951.

France

THE TELEPHONE SYSTEM of France, with a total of 2,520,762 telephones, ranked fifth in size among those of the world at the beginning of 1952. The development of 6 telephones per 100 inhabitants is rather low as compared with that of other principal countries, as is also the average per capita calling rate of 41 conversations reported for 1951.

When the telephone was introduced at the World's Fair in Paris in 1878, the government stated that all operation of telephone service would be reserved to the government. Instead, however, the government granted franchises to three private groups which combined in 1880 to form the General Telephone Company. The first local exchanges were opened in Paris in 1881. By 1885 there was such a demand for long distance lines that the government decided to construct and operate them. On expiration of the local service franchises in 1889, the government purchased the General Telephone Company's local plant, and since that time has continued to operate all telephone service in France. The administrative organization of communications services in France has been changed some half-dozen times. Since 1930 these services have constituted the Ministry of Posts and Telegraphs.

There is no party-line service in France, but extension subscriptions are offered whereby a subscriber has

TELEPHONES IN CONTINENTAL AREAS
January 1, 1952[a]

Continental Area	Total Telephones			Privately Owned		Automatic (Dial)		Connecting with Bell System	
	Number	Per Cent of Total World	Per 100 Population	Number	Per Cent of Total Tels.	Number	Per Cent of Total Tels.	Number	Per Cent of Total Tels.
NORTH AMERICA	48,796,300	61.5	28.7	48,353,000	99.1	34,909,100	71.5	48,778,000	100.0[b]
MIDDLE AMERICA	593,700	0.7	1.1	540,500	91.0	422,700	71.2	586,800	98.8
SOUTH AMERICA	1,931,000	2.4	1.7	966,200	50.0	1,468,400	76.0	1,830,200	94.8
EUROPE	22,362,000	28.2	3.6	3,453,400	15.4	15,903,500	71.1	20,611,400	92.2
AFRICA	986,000	1.2	0.5	18,200	1.8	648,800	65.8	853,600	86.6
ASIA	2,944,000	3.7	0.2	213,100	7.2	1,393,000	47.3	1,832,000	62.2
OCEANIA	1,787,000	2.3	12.2	125,400	7.0	1,156,400	64.7	1,775,100	99.3
WORLD	79,400,000	100.0	3.3	53,669,800	67.6	55,901,900	70.4	76,267,100	96.1
UNITED STATES	45,636,437	57.5	29.3	45,636,437	100.0	32,900,000	72.1	45,628,369	100.0[c]

[a] Partly estimated; statistics reported as of other dates have been adjusted to January 1, 1952.
[b] Less than 0.04 per cent do not connect.
[c] Less than 0.02 per cent do not connect.

The World's Telephones

The continued great excess of demand over supply of telephone service in Japan has given rise to a situation, described two years ago in *Telephony* magazine, which seems fantastic to a Western observer. A recognized brokerage business for filling applications for telephone service has long existed in Japan. As much as the equivalent of $3,000 has been paid for the "right" to buy a telephone. Telephones owned by persons moving away from the city, those inherited from a deceased subscriber, or those which are to be sold for some reason, are purchased by a broker and resold. As a business firm lists after its name in the directory the telephone numbers of employees, and as a long list contributes to the firm's prestige, the man who owns a telephone has a better chance of getting a job than has the man without one. Ownership of a telephone may constitute an inheritance, a dowry for a daughter, or collateral against a loan. A lucky number—one homonymous with a word having a pleasant connotation—commands a high price. An unlucky number may bring a price differential as great as $300. An example of a number in disfavor among inhabitants of the "Flowery Kingdom" is any combination ending in "42", for "42" is pronounced "shi-ni", which also means "to die."

access to the network through the station of a principal subscriber.

Japan

JAPAN had 2,013,439 telephones on March 31, 1952, or 2.4 telephones per 100 of the population. Nearly 70 per cent of Asia's telephones are concentrated within this small country.

Telephone service was first offered to the public in Japan in 1890, when the government opened exchanges in Tokyo and Yokohama. The domestic telephone system was operated by the Ministry of Communications until August 1952, when an administrative reorganization placed this service under the newly created government agency called the "Nippon Telegraph and Telephone Public Corporation."

Development of the telephone was slow in Japan. There were 0.4 telephones per 100 population in 1915, 1.9 in 1939. Because of costly armament and naval programs, destructive earthquakes, and severe depressions, provision for expansion of the telephone system was postponed in favor of other national programs.

Due to the shortage of equipment, Japan's annual calling rate per telephone is extremely high—about 4,000, as compared with 1,300 for the United States in 1951. However, the per capita calling rate was 89 for the same year. During the war, 55 per cent of subscribers' telephones were disabled or destroyed. Great progress in reconstruction has been made since the termination of the war, and the present number of telephones is the largest in Japan's history. Continued progress is indicated under the new telecommunications administration.

Sweden

AS REGARDS ratio of telephones to population, Sweden, with 25 telephones per 100 persons, ranks second only to the United States. Stockholm

is the only foreign city in which telephone development (50) approximates that obtaining in the most highly developed urban areas of the United States.

The International Bell Telephone Company built Sweden's first telephone exchanges in 1880. The Stockholm General Telephone Company entered into telephone competition in 1883, and shortly thereafter development of service in small communities was begun vigorously. By 1885, there were fifty mutual and coöperative societies and small local corporations. In the meantime, the government granted authority to the Telegraph Board to construct lines in places which were without service. Thus, the Swedish Government began to compete with private telephone companies, and gradually purchased local telephone plant throughout the country.

On January 1, 1952, Sweden had 1,788,874 telephones available to the public. All but 1900 of these were operated by the government through the Royal Board of Telegraphs.

Party-line service is seldom used in Sweden, and is available to rural customers only. In domestic toll service, "Urgent" and "Lightning" categories of call are offered at twice and twenty times the ordinary rates, respectively. The average number of calls per person in 1951 was 310, placing Sweden third in this respect among the world's principal countries.

Italy

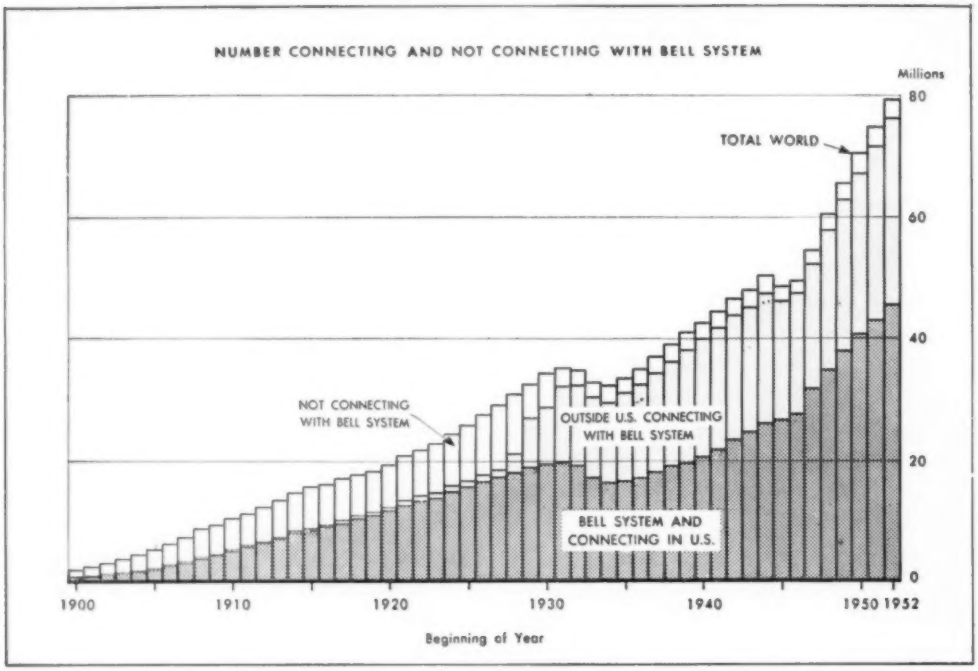
ITALY'S TELEPHONE SYSTEM ranked eighth in size among those of the world. Its 1,382,438 telephones in service at the beginning of 1952 were operated by five concessionary companies, each of which provides local and toll service within its respective zone. Interconnecting long distance service is operated by the government through the Government Agency for Telephone Services.

Telephone service was initiated in 1881 by private companies operating under franchises granted by the government. This was a period of social unrest and labor disturbance, and the government was not disposed to assume the risks of developing the new business. In succeeding years, however, it constructed toll lines and local networks. The granting of more than one franchise for one city made normal progress impossible. The various laws were unified in 1903, and in 1925, under Mussolini's reorganization program, the structure of Italian telephone service was given the form obtaining today.

On January 1, 1952, Italy's telephone development was three telephones per 100 of the population. The per capita calling rate for the year 1951 was 50. In domestic toll service, the charge for an "Urgent" call is three times that for an ordinary call, and for a "Very Urgent" call there is an additional charge of 200 Lire per 3-minute unit. In purchasing equipment, the operating companies must give preference to national industry unless its prices exceed those of foreign industry by more than 10 per cent.

Australia

THERE WERE 1,259,212 telephones in Australia at the beginning of 1952, or 15 per 100 of the population. An



The World's Telephones

average of 122 calls per person were made in 1951.

The first telephone system in Australia, the Melbourne Telephone Exchange Company, Victoria, was established in 1880. The company was unable to secure franchises from the other state governments, which began to construct their own systems. The Victoria State Government purchased the privately-owned company in 1897. Since the formation of the Commonwealth of Australia in 1901, all telephone service has been in the hands of the Commonwealth government, and is operated by the Department of the Postmaster General.

Switzerland

SWITZERLAND ranks second to Sweden among European countries in telephone development, with 20 telephones per 100 persons. The telephone system is under the jurisdiction of the Director General of Posts, Telegraphs and Telephones.

Early progress of the telephone was rapid in Switzerland. At the beginning of 1911 there were 2.1 telephones per 100 inhabitants in Switzerland, 1.5 in Great Britain, 1.6 in the German Empire, 8.2 in the United States. The first exchange, opened in Zurich in 1880 by the International Bell Telephone Company and having 141 main lines, was operated under a government franchise until 1886, when it was purchased by the government administration. In 1890 the national network comprised 9,492 main lines.

In domestic service (local and toll) in the year 1949, 96 per cent of calls were established through automatic

switching. Party-line service is available only in remote places, where two subscribers at most are connected on the same line. At the beginning of 1952 there were fewer than 50,000 party lines. The populace of Switzerland averaged 152 calls each in 1951.

New Zealand

THERE WERE 394,566 telephones in New Zealand on March 31, 1952, all of which were operated by the General Post Office. The telephone development per 100 population, 20, is the fifth-highest among the world's principal countries. New Zealand's four largest cities have 37 per cent of the country's population, 39 per cent of its telephones.

The first telephone exchange was opened by the government in 1881. Remarkable progress was made, for at the beginning of 1914 there were 4.6 telephones per 100 of New Zealand's population, while the development for Great Britain at that time was 1.7, for the German Empire 2.1, France 0.8, Spain 0.2, the United States 9.7.

Since nearly two-thirds of New Zealand's people live in rural areas, where multi-party service is offered, the proportion of party-line to total telephones is high, being about 35 per cent. New Zealand does not report conversation data, inasmuch as local service is offered on a flat-rate basis and no count of local calls is made.

Denmark

ON JANUARY 1, 1952, Denmark had 760,244 telephones in service, 95 per cent of them being operated by three private concessionary companies. The government, through the Direction General of Posts and Telegraphs, operates interconnecting long distance service throughout the country, and local service in South Jutland, on Moen Island, and in several small localities. A development of 18 telephones per 100 of population places Denmark sixth in this respect among the world's principal countries.

The first telephone service in Denmark was given in 1880 by the International Bell Telephone Company, which sold its plant two years later to a Danish corporation, the Copenhagen Telephone Company. This company currently operates some 60 per cent of the country's telephones.

Party-line service is offered in Denmark, party lines constituting 15 per cent of the Copenhagen Telephone Company's total number of lines. The average number of calls per person reported by the Director General for the country was 257 for 1951, which places Denmark fourth among the principal countries in this regard.

THIS INFORMATION has been expanded from material in the most recent issue of "Telephone Statistics of the World," which is almost wholly statistical in content. A copy may be obtained upon request to the Chief Statistician of A. T. & T.

In Three Years 6,500,000 School Children Have Learned To Use the Telephone Properly through a Bell System Motion Picture and Associated Teaching Aids

"Telezonia" and the 3 Rs

LeRoy A. Born and Stuart D. Harter

THE TELEPHONE is today as much a part of the child's daily life as of the adult's. Teaching its proper use is, of course, the responsibility of the parent and the school. The role of the telephone companies is to provide, if and when asked, authentic information which the experience of the business has shown to be helpful to telephone users of whatever age.

In 1952, more than 2,000,000 children in some 70,000 classrooms learned how to use the telephone properly: learned through a specific educational program sponsored by the Bell telephone companies. Since its introduction in 1950, the program has been effective in teaching about six and a half million children in public, parochial and private schools.

As a result, fewer receivers are left off the hook, party-line interference is decreasing, and dialing habits are improving—especially among the younger generation.

The program is based on a color motion picture, "Adventure in Telezonia," * about a boy and his dog. But it is made effective by the addition of a package of materials which includes a silent filmstrip † for classroom discussion, a pamphlet for children on how to use the telephone, a teacher's guide explaining the material, and two local directories and a pair of telephones so the children can take turns practicing what they learn.

The Telezonia program has been accepted by over half the country's school systems, and requests for the material have come from as far away as Japan and the city of Bagdad. A French version produced by the Bell Telephone Company of Canada for use in the Province of Quebec has been well received by French children.

Introduction of "Telezonia"

TO HELP EQUIP the telephone manager in each community to carry out the Telezonia program, training in its purpose and objectives was needed; procedures had to be devised and

* See "Adventure in Telezonia," Magazine, Spring 1950.

† A series of still pictures on a strip of film for projecting on a screen one at a time.

written to conform with varying local situations; and interviews with school superintendents, administrators, and teachers had to be planned and carried out.

These tasks were made easier because school people recognized that help had been received from educators in the preparation of the material so it would fit into school teaching methods. Wayne University, in Detroit, Mich., acting as consultant to the Bell System in the preparation of the motion picture and development of the teaching material, found from questioning over two thousand school principals that there was an educational need for teaching good telephone usage and that it should be taught in about the fourth grade. That is where it is being used in most schools today.

When the material has been accepted in a school system, there is still more to do. For between acceptance and use lies the problem of supply. Many school systems have central libraries controlling film circulation. Some are equipped to handle other teaching aids, such as booklets, practice telephones, and directories. Others are not, and may prefer that all or parts of the kit be ordered directly by the individual school or teacher through the local telephone company office. Local telephone managers over the entire country are working closely with the schools to meet their needs and at the same time make best use of the 2,000 prints of the motion picture and some 3,600 filmstrips which are available.

After Telezonia has been accepted and put into use come frequent follow-up visits with principals and teachers to exchange up-to-date experiences received from other schools, so that all may use the material effectively. Educators and teachers have asked for this help in bringing to them experiences of other teachers.

> *"Who is in the better position to tell of the miracles of 20th century communications than the Bell Telephone Companies? . . . Adventure in Telezonia . . . represents one of the most fascinating developments in the field of the sponsored film . . . the contribution of the American Telephone Company to the schools of America."*
>
> John Guy Fowlkes, Dean of the School of Education, University of Wisconsin, in the foreword to the 1950 Edition of "Educators' Guide to Free Films."

Classroom Use

THE MOTION PICTURE and filmstrip are helping the children understand good telephone usage and the importance of the telephone in their daily lives. Pupils are taught through classroom practice how to apply the principles they have learned, by simulating conversations over the telephone instruments and by looking up numbers in the local directory. The pupils are paired to take turns in "making" and "receiving" calls. Every step of the call is performed, from looking up the telephone number and writing it down, waiting for the dial tone or the operator's "Number, please?" as the case may be, dialing or giving the number to the operator, through the telephone conversation itself to the friendly goodbye and quiet replacement of the instrument.

Teachers devise many ingenious ways to impress on the children the importance of the telephone and its proper use. Attending a classroom session on Telezonia, as telephone people often do, is likely to be a fascinating experience.

First to strike the eye are posters which the children have drawn and pinned on the walls. Usually done with crayons, their gaudy colors and originality defy description. In one, telephone instruments dance weirdly around what seems at first to be a Maypole but which on further inspection appears to sprout insulator-studded crossarms, down which linemen are sliding cheerfully on their backs. In another, the march of time is portrayed by a smoke signal in the background under a carrier pigeon's baleful eye. But from behind this merry façade, the evidence shines through that the young Van Goghs have learned their lessons on telephone courtesy, coöperation, and good usage.

The alert attention of the youngsters to the Telezonia film itself, and their rapt interest in the teacher's carefully organized review with the filmstrip, are highly impressive.

And the discussion of the good-usage booklet, with its enthusiastic participants practicing their learning, will warm the hearts of telephone men and women.

Here are some of the various classroom uses to which teachers have adapted the Telezonia material:

Language and Vocabulary

Writing letters, stories, poems and songs about using the telephone.

Spelling and use of such words as party line, dial tone, mouthpiece, receiver, signal, number plate, switchboard, operator, directory, emergency.

Alphabetizing:

Looking up names in the telephone directory; making one's own personal directory of friends and tradespeople the child or his parents might call.

Picture-book project:

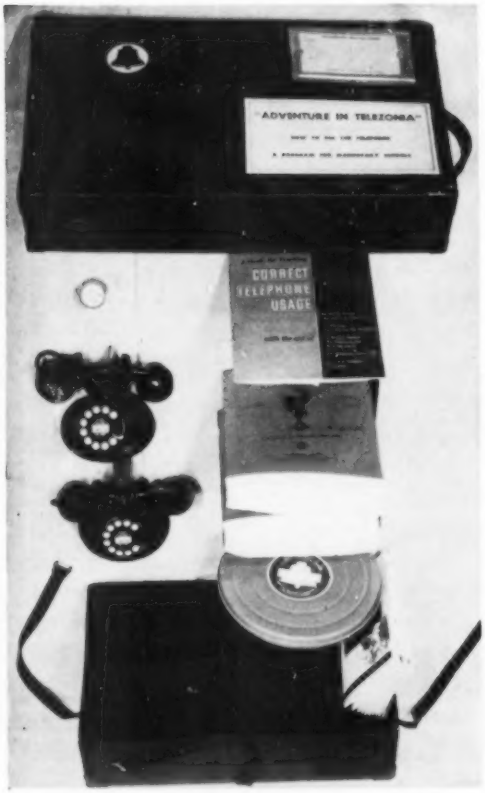
Making picture-books from magazine illustrations of people using the telephone and of telephone equipment.

Sand-table project:

Such as stringing a telephone line between houses and a central office.

Citizenship:

How to be good party line neighbors and knowing how to use the telephone in an emergency.



The elements of the Telezonia package

A telephone man and a teacher were chatting in a California class-

School children and a telephone company representative join forces to explain and demonstrate the Telezonia project to student teachers at a teacher training institution

room while waiting for the children to assemble. The former remarked: "Looks as though you can use Telezonia for about everything but arithmetic." A while later, during the class discussion, the teacher asked one child: "Sally, if it costs $1.65 to call from here, say, to Boise, Idaho, how many nickels, dimes and quarters would you put into a coin telephone to pay with the fewest coins?" As the child replied, the teacher glanced toward the telephone man with a certain gleam in her eye.

One classroom in Wisconsin uses long distance routes, furnished at the teacher's request by the Wisconsin Telephone Company, for teaching geography. A child places a "pretend" call from Milwaukee to New York or San Francisco while another child traces the route on a blackboard map. There is even a make-believe switchboard operated by one of the girls, and the class has designed a mock radio-relay tower for realism.

A telephone official visiting a school gathering in his home town found to his surprise that the children were reenacting the marionette story of Adventure in Telezonia with puppets they had made themselves.

A class in an Ohio school presented a playlet one Saturday morning before a Parent-Teachers Association meeting. Written by the pupils, it concerned a space-cadet named Tayo, who visited the earth from the skyland of Eros. He asked the earth-children about a strange black object he had noticed everywhere. When they explained that it was a telephone, and showed him how to use it properly, his timidity about it was overcome.

In another Ohio community, the school's audio-visual director inquired how the telephone company could supply answers to questions the children were asking about the telephone. Thereupon, the teachers using Telezonia were invited to visit and inspect

the telephone building, after which they exchanged experiences in a round-table meeting. The audio-visual director later reported that in his opinion the teachers' effectiveness in using the materials had increased threefold.

Plant Participates

LAST SPRING, as part of a Telezonia program, an installer drove his truck into a Massachusetts schoolyard and parked. Behind him a Commercial Department man in a passenger car, Bell System seal on the door, drew up. Before the drivers could alight, a group of youngsters, teacher alongside, came marching toward them from the wide school doorway. As the installer took his position at the rear of the truck, the youngsters formed a circle around him, solemn save for the light of eager curiosity in their eyes.

There was a responsive light in the eyes of the installer, a reflection of his merry smile. "Hello, girls and boys. Anybody know what these are for?" As he brought forth tools and equipment, piece by piece, heads leaned forward and eyes grew bigger and more intense. Eagerness became vocal, first shyly. Then the trickles of response gushed forth in a tumbling flood of answers and guesses and questions.

First he told them how a telephone was installed, from the instrument to the pole. This led to safety: "Poles

A telephone installer explains his job to interested youngsters

are too dangerous for even a big fellow like me to climb without this belt and strap. Electricity can be dangerous, too. Never touch a fallen wire. It can kill you. Even with these very special gloves, you have to be sure you know how to handle it."

Classroom practice in telephoning

When he was done, the commercial man at the rear car brought out a vehicle telephone from under the dashboard. "Know how this works? . . . . . That's right, by radio. Let's call your school secretary." He passed the instrument from ear to ear. The call had to be short, for mobile telephone channels are very busy these days. "Like the party line some of you have at home. When your neighbor on the same line down the street wants to use it, I know you always end your call promptly. I know that, from the nice manners I see you all have." They didn't dare lift their slightly guilty faces to the skeptically amused glance of their teacher.

It was hard to tell who enjoyed the visit most—the children, the teacher, or the telephone men. But as to what the youngsters learned there could be little doubt. Back in the classroom, they drew pictures of what they had seen and heard and the details they recalled were amazing. Only an observer could fully realize the impact which must have etched in the minds of youngsters a new respect for the telephone and its courteous use.

A number of telephone companies are working with school people to organize various activities which teachers build around Telezonia into an integrated instructional program about the telephone and its use in modern living. Such a program would have great usefulness among new teachers entering the school system, helping them to a better understanding of the purpose and possibilities of Telezonia.

The effect of these classroom projects is to impress upon the child that using the telephone is an experience which he shares with his neighbors, and that using it considerately is one way of becoming a good citizen.

The enthusiasm of the child is often reflected in the home. Teachers tell us that parents often gratefully mention the beneficial effects of the instruction on the child's use of the telephone.

Press, Radio, and TV Mention

THE VALUE of Telezonia has been recognized by school publications, teachers' magazines of national circulation, the press, radio, and television. One mid-western newspaper told the story of Telezonia with four photographs in color from the motion

picture. From coast to coast, newspapers large and small have told the story of how the telephone industry is working with schools and educators to bring to the community better telephone service through education of the younger generation.

A Massachusetts radio station broadcast a recording of a half-hour session on Telezonia in one of the schools. The program was made up by the children themselves, who explained the rules of good telephoning, presented skits about calling the doctor and the fireman in emergencies, and sang songs they had made up themselves.

As part of a "Partners in Progress" series, a California station televised a program in which four school children demonstrated good telephone usage by means of four skits on telephone calls and by explaining how to look up telephone numbers in the directory.

Teachers supplement their own understanding of the telephone by visiting a central office

As a result of an item about Telezonia in a national magazine, an eastern television station asked a telephone company representative to appear on a "housewives'" program to explain the Telezonia kit, and it was also discussed over a number of other local radio stations.

Informing Educational Groups

MUCH INTEREST in Telezonia has been expressed by teacher-education institutions, particularly in courses on the use of films and other teaching devices. One telephone company reports that the materials have become a part of elementary education courses at all state universities in its territory and have been presented in most of the teachers' summer courses throughout the region. In many cases, telephone company representatives are asked to take over entire class periods to present Telezonia and explain its use to student teachers.

Publicity originating from the telephone company has been limited to school people and, with their consent, to community groups—like the Parent-Teacher Associations—interested in the schools.

Several Companies have built displays for use at teachers' meetings and conventions and considerable use is made of these and of slidefilms and motion pictures.

It Proves to Be Effective

THAT TELEZONIA has been so widely accepted by the schools is a tribute to the educators under whose guidance

and counsel it was produced. It is they who suggested the teaching principles that underlie its form and content.

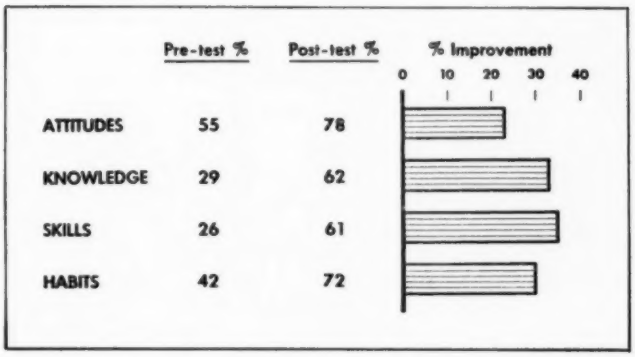
By the same token, it is the educator's province to say what the children really learn from it, what effect the teacher's use of it has upon their ability to use the telephone properly. Mr. Louis J. Schmerber, Superintendent of Schools in Paterson, N. J., determined to find out. A committee of six, his assistant and five principals, devised a test based on standard types of attitude and performance measurements used in the field of elementary education.

A Telezonia display shown at teachers' conventions and other educational meetings

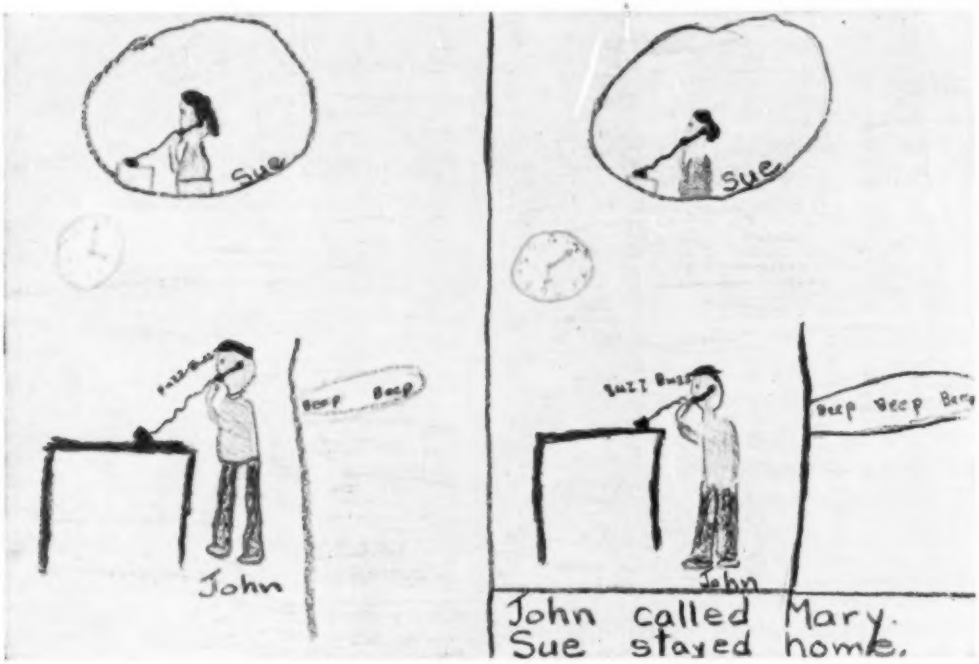
The test, given to fourth-grade pupils, is in two parts. There are four lists of questions for each child to fill out with a *yes* or *no* answer, first before and again after the Telezonia instruction. These are designed to test the effect of the instruction on the child's telephone habits, attitudes, knowledge, and skill according to the meaning of these terms in elementary education. The parents are also provided with these lists, so that they too can observe and check the child's actual use of the telephone at home.

An evaluation was made of the questionnaire part of the test given to all 792 pupils in the first term of the fourth grade in 21 public schools. The percentage of pupils reaching a perfect 20 or near-perfect 19 score on the pre-test was compared with the percentage reaching these scores in the post-test. The results appear on the accompanying chart.

The report of the evaluation to the superintendent stated: "From these comparative figures, it can be seen that there was marked growth in each area as the result of teaching the telephone unit, and that this growth



"Before and After" Telezonia



Telezonia inspires pupils to creative art

was greatest in skill and knowledge, in which areas the pre-tests were poorest."

Mr. Robert LeAnderson, Supervisor of Visual Education of the Detroit public schools, conducted an evaluation of a different type. One group of children was assigned to study only the student's booklet, another only the filmstrip, a third group only the motion picture, a fourth, called the "combined group," was exposed to all the contents of the kit except the telephone instruments. A fifth was used as a control against which the performance of the other four groups was measured. Each was equal to the others in intelligence level and reading ability.

It was found that each item in the Telezonia kit is of real help in developing skill and knowledge in the proper use of the telephone, and that learning is most effective when the materials are used in combination.

Other studies support these general conclusions.

The effect was measured in two mid-western cities where 38 of the 40 school systems taught Telezonia, involving 261 teachers and 9,267 students. Party-line interference cases decreased 18% in one city and 38% in the other. "Dialed calls abandoned" was down 54% and "customer dialing irregularities" was reduced about 31%. What part of these improvements can be definitely attributed to Telezonia would be difficult to estimate, because of the varied and continuing efforts to improve both party-line coöperation and dialing habits. However, local telephone people feel that it is more than a coin-

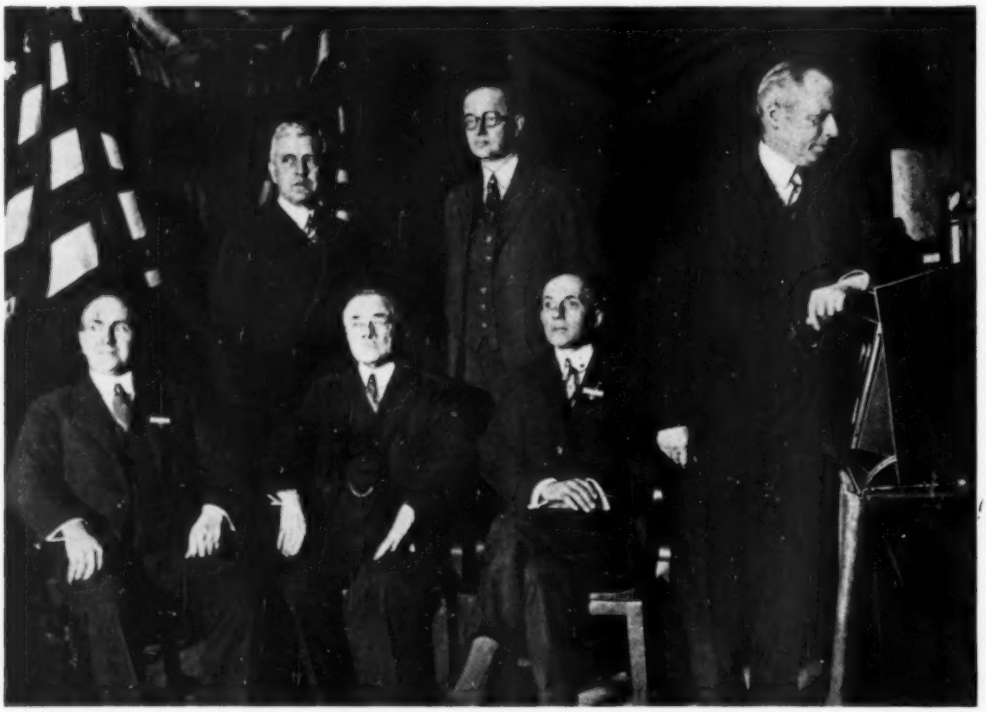
cidence that the improvement took place after the introduction of an intensive Telezonia program.

The impact of teaching good telephone usage to over two million children each year, which represents about 60 per cent of the nation's fourth-graders, is being felt in all areas of the country.

Whatever success Telezonia enjoys and continues to enjoy is due to the ingenuity of all teachers, many of whom find unsuspected uses for it in carrying out their educational tasks. It is in like measure the result of the intelligent and painstaking work of hundreds of telephone managers, and the close coöperation of other local telephone men and women who help these educators in their efforts to inculcate in today's fourth-graders a greater respect for good telephone usage.

If the success of Telezonia to date is a presage of its future, it bids fair to have a place of its own in helping to prepare tomorrow's citizens for the world in which they will live. Learning at an early age how to use the telephone properly is the first step in forming and retaining good telephone habits.

Twenty-five Years Ago in the Bell Telephone Quarterly: Volume VII, Number 2



A. T. & T. officials at an A. I. E. E. session in New York on February 16, 1928, held jointly with a session of the British Institution of Electrical Engineers in London by radio telephone. Left to right, seated: H. P. Charlesworth, Plant Engineer; J. J. Carty, Vice President; F. B. Jewett, Vice President, President of Bell Laboratories; standing—K. W. Waterson, Assistant Vice President; O. B. Blackwell, Transmission Development Engineer; Bancroft Gherardi, Vice President and Chief Engineer

THE SIXTEENTH winter convention of the American Institute of Electrical Engineers, February 13–17, 1928, was of interest to Bell System people for several reasons. Bancroft Gherardi, Vice President and Chief Engineer of the A. T. and T. Company, was President of A. I. E. E. and presided at the general sessions. H. P. Charlesworth, A. T. & T. Plant Engineer, was chairman of the committee on meetings and papers and conducted several technical sessions. Part of one evening was given over to the presentation of the John Fritz Medal to John J. Carty, A. T. & T. Vice President, "for pioneer achievement in telephone engineering and in the development of scientific research in the telephone art." Mr. Gherardi made the presentation, and, in the course of his address, referred to Mr. Carty as "the dean of telephone engineers." Mr. Carty, accepting the honor, addressed the society on "The Ideals of the Engineer."

The outstanding event of the convention was a "joint meeting" with the British Institution of Electrical Engineers on February 16, made possible by the trans-Atlantic radio telephone service established

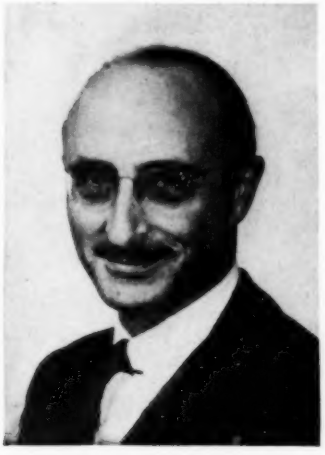
with London the preceding year. In New York, Mr. Gherardi, Mr. Carty, and Dr. F. B. Jewett, A. T. & T. Vice President and President of the Bell Telephone Laboratories, addressed the two gatherings. The speakers in London were Mr. Archibald Page, Chief Engineer of the Central Electricity Board; Colonel Purves, Engineer in Chief of the British Post Office: and Sir Oliver Lodge. Says the contemporary account: "There was little to choose between the amplified voices of the American speakers, reaching the audience through a cluster of horns above the stage, and the British accents emanating from the same horns."

Who's Who & What's What

(*Continued from page 3*)

LeRoy A. Born began his Bell System career as a contract agent with the New York Telephone Company in Syracuse in 1922. Subsequent experience included commercial and sales training and sales and servicing work. In 1944 he transferred to the Public Relations Department of the A. T. & T. Co., where he is engaged in film and display work. Here he has guided and coördinated all phases of the "Telezonia" project. His interest in the educational value of motion pictures is understandable in the light of a youthful two years' experience as a teacher in a "little red school house," a B.S. degree in education *summa cum laude*, and membership in two honorary educational societies. This is Mr. Born's second contribution on the topic, his "Adventure in Telezonia" having appeared in this Magazine for Spring 1950.

A year and a half after Stuart D. Harter joined the Commercial Department of the Chesapeake and Potomac Telephone Company in Washington in 1941, he received a military leave of absence, and served with the Coast Guard during World War II in air-sea rescue operations. Returning to the C. & P. Company after the War, he served successively on the Commercial Training and Results staff, as Business Office supervisor, and as commercial manager. In 1952 he transferred to the Commercial Division of A. T. & T.'s O. & E. Department. Here he works on Customer Relations matters—which include, among other items, such things as developing an acceptance of the Telezonia program.



LeRoy A. Born

Stuart D. Harter

The New Frontier

Where is the frontier today?

Two hundred years ago it was in the back yards of the colonists on the eastern plain between the Alleghenies and the sea. Then men in fringed buckskins pushed it back over the mountains. Hunters and trappers drove the frontier across the prairies. Men and women in covered wagons rolled it over the Rockies and into the western ocean.

Then, people said, "The frontier is gone. There's nothing left to explore or develop. There are no more frontiers."

How wrong they were!

Today there is an endless frontier: the frontier of science. And telephone engineers and scientists are at work all along this modern frontier . . . in physics, in chemistry, in mathematics, in botany, in biology. In physics to improve the speed and quality of telephone communication. In chemistry to find better materials for telephone equipment. In biology and botany to find ways to protect telephone equipment against such pests as fungus and insects. They will follow any avenue of study that may lead them to improvements in your telephone service.

Behind all this there is *basic* research—the exploration of the unknown. This is a thrilling search for new ideas, for new principles and new materials.

At Bell Laboratories, as in other laboratories across America, this basic research continues year after year, helping to push back the frontiers of science, adding to the sum total of human knowledge. This basic research ultimately reaches *you* in the form of better telephone service for you and your family. Improving your telephone service is a never-ending task of the Bell System because your need for telephone service keeps on growing.

"Telephone Story" from the Telephone Hour radio program

PRINTED IN THE U. S. A.

In the last few years the people of the United States have called on the Bell System companies to install and operate more new telephones than the entire number they served before the war. This country has always enjoyed the best telephone service in the world. Today, in the abundance and scope of the service—in its ability to meet new needs—in its importance to the welfare and security of the nation—the value of the telephone has reached a new high.

The Bell System intends and expects to keep this value growing. Our research is charting new paths. Our laboratories and our telephone manufacturing and operating organizations work closely and effectively together and they are all devoted to the common purpose of serving the public well. Telephone people in all branches of the business have the will as well as the skill to provide an ever-improving service at the lowest possible cost. . . . We must prosper to serve well. We must serve well to prosper. We must have capable, well-paid employees who find real opportunity in the business. We must think and act for the long run.

This policy is in the public interest and is the mainspring of all our effort. With eagerness and enthusiasm, we look forward to rendering ever better and more valuable service to the nation.

From the A. T. & T. Annual Report for 1952